9-2350-256-10/990

TM9-2350-256-10

TECHNICAL MANUAL

OPERATOR'S MANUAL

RECOVERY VEHICLE
FULL TRACKED:
MEDIUM, M88A1
(2350-00-122-6826)

Headquarters
Department of the Army
Washington, D.C.

This copy is a reprint which includes current pages from Changes 1 through 6.

MARCH 1977

READEX FICHE best copy available

D 101.11:

WARNING

CARBON MONOXIDE POISONING CAN BE DEADLY

CARBON MONOXIDE IS A COLORLESS, ODORLESS, DEADLY POISONOUS GAS WHICH, WHEN BREATHED, DEPRIVES THE BODY OF OXYGEN AND CAUSES SUFFOCATION. EXPOSURE TO AIR CONTAMINATED WITH CARBON MONOXIDE PRODUCES SYMPTOMS OF HEADACHE, DIZZINESS, LOSS OF MUSCULAR CONTROL, APPARENT DROWSINESS, COMA. PERMANENT BRAIN DAMAGE OR DEATH CAN RESULT FROM SEVERE EXPOSURE.

IT OCCURS IN THE EXHAUST FUMES OF FUEL-BURNING HEATERS AND INTERNAL-COMBUSTION ENGINES AND BECOMES DANGEROUSLY CONCENTRATED UNDER CONDITIONS OF INADEQUATE VENTILATION. THE FOLLOWING PRECAUTIONS MUST BE OBSERVED TO INSURE THE SAFETY OF PERSONNEL WHENEVER THE PERSONNEL HEATER, MAIN, OR AUXILIARY ENGINE OF ANY VEHICLE IS OPERATED FOR MAINTENANCE PURPOSES OR TACTICAL USE.

1. DO NOT operate heater or engine of vehicle in an enclosed area unless it is ADEQUATELY VENTILATED.
2. DO NOT idle engine for long periods without maintaining ADEQUATE VENTILATION in personnel compartments.
3. DO NOT drive any vehicle with inspection plates, cover plates, or engine compartment doors removed unless necessary for maintenance purposes.
4. BE ALERT at all times during vehicle operation for exhaust odors and exposure symptoms. If either are present, IMMEDIATELY VENTILATE personnel compartments. If symptoms persist, remove affected personnel from vehicle and treat as follows: expose to fresh air; keep warm; DO NOT PERMIT PHYSICAL EXERCISE; if necessary, administer artificial respiration.

THE BEST DEFENSE AGAINST CARBON MONOXIDE POISONING IS ADEQUATE VENTILATION.

WARNING

HIGH VOLTAGE

is used in the operation of some equipment.
SERIOUS INJURY
may result if personnel fail to observe safety precautions.
Learn the areas containing high voltage in each piece of equipment.
Be careful not to contact high voltage connections when installing or operating this equipment.
Before working with electrical equipment, harnesses or battery cables turn master switch to OFF position and disconnect battery ground cables.

OBSERVE THE WARNING NOTES THROUGHOUT THIS MANUAL.

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OPERATOR'S MANUAL FOR RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1 (NSN 2350-00-122-6826)

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2-93 and 2-94	2-93 and 2-94
3-19 and 3-20	3-19 and 3-20
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3-32.1 and 3-32.2	3-32.1 and 3-32.2
3-32.3/3-32.4 Blank	3-32.3/3-32.4 Blank
B-35 and B-36	B-35 and B-36

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General, United States Army
Chief of Staff

Official:

R.L. DILWORTH
Brigadier General, United States Army
The Adjutant General

Distribution:

To be distributed in accordance with DA Form 12-37, Operator Maintenance requirements for Recovery Vehicle, Medium Full-Tracked, M88A1.

WARNING

Grenades contain RP that constitutes a fire hazard and danger to all personnel outside the vehicle.

Be sure that arming switch is off (lamp not lit) before loading grenades into a discharger.

Never place your body in front of dischargers when loading grenades or when dischargers are loaded.

Be sure that arming switch is off (lamp not lit) before unloading grenades from a discharger.

Never place any part of your body in front of dischargers when unloading grenades from a discharger.

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CHANGE

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Operator's Manual
for
RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1
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3-9 and 3-10	3-9 and 3-10
3-32.3/(3-32.4 blank)	3-32.3/(3-32.4 blank)
B-12.1 thru B-26	B-12.1 thru B-26
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B-39/(B-40 blank)	B-39/(B-40 blank)
None	C-1 thru C-4

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none	3-26.1 and 3-26.2
3-32.3/(3-32.4 blank)	3-32.3/(3-32.4 blank)
3-48.1/(3-48.2 blank)	3-48.1/(3-48.2 blank)
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none	3-66.1/(3-66.2 blank)
3-75 and 3-76	3-75 and 3-76
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B-12.1 and B-12.2	B-12.1 and B-12.2
B-15 thru B-24	B-15 thru B-24
B-27 thru B-30	B-27 thru B-30

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By Order of the Secretary of the Army:

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General, United States Army
Chief of Staff

Official:

ROBERT M. JOYCE
Major General, United States Army
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1-1 and 1-2	1-1 and 1-2
1-7 and 1-8	1-7 and 1-8
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Warning page	Warning page
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viii.i (viii.ii blank)	viii.i and viii.ii
xv through xviii.ii (xviii.ii blank)	xv through xviii.ii
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None	2-116.1 and 2-116.2
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Remove Pages	*Insert Pages*
3-47 and 3-48	3-47 and 3-48
None	3-48.1 and 3-48.2
3-59 and 3-60	3-59 and 3-60
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None	4-22.1 and 4-22.2
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None	4-37 through 4-42
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Index 1 through Index 18	Index 1 through Index 18

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xvii and xviii	xvii and xviii
None	xviii.i (xviii.ii blank)
1-7 and 1-8	1-7 and 1-8
None	1-8.1 (1-8.2 blank)
1-11 and 1-12	1-11 and 1-12
2-5 and 2-6	2-5 and 2-6
2-29 and 2-30	2-29 and 2-30
3-27 and 3-28	3-27 and 3-28
None	3-28.1 (3-28.2 blank)
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None	4-21 through 4-36
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OPERATOR'S MANUAL
FOR
RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1
(NSN 2350-00-122-6826)

REPORTING OF ERRORS

You can help improve this manual by calling attention to errors and by recommending improvements and by stating your reasons for the recommendations. Your letter or DA Form 2028, Recommended Changes to Publications, should be mailed direct to Commanding General, US Army Tank-Automotive Command, ATTN: DRSTA-MBC, Warren, MI 48090. A reply will be furnished direct to you. For your convenience, preaddressed DA Forms 2028 are included as final pages of this manual.

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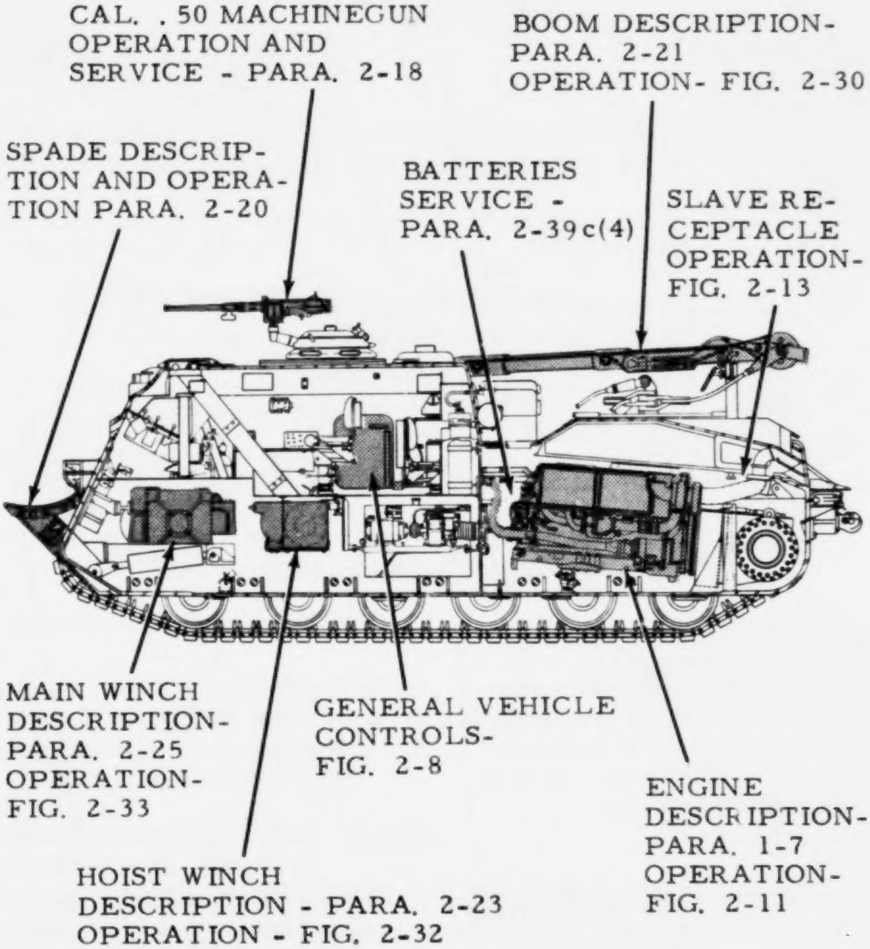
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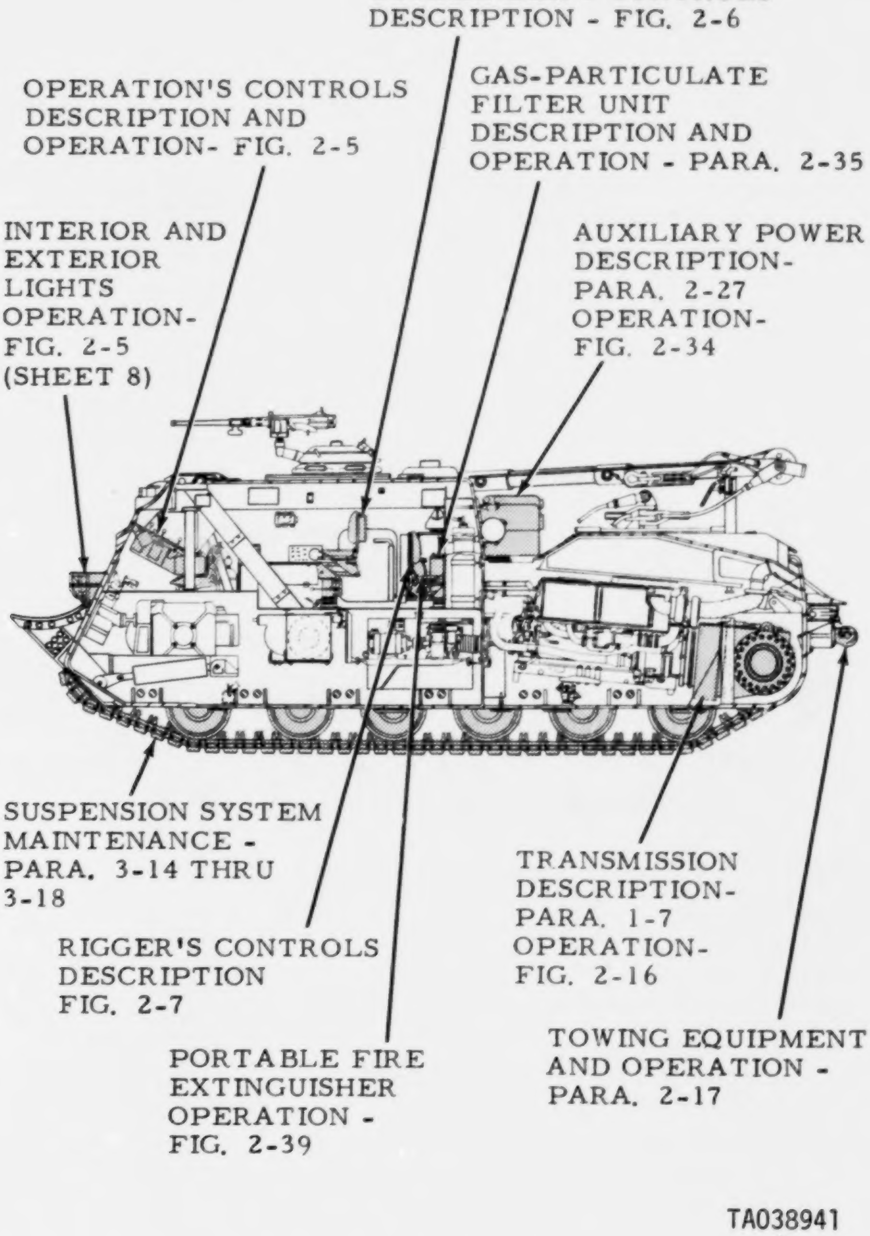
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CHAPTER 1

INTRODUCTION

Section I. GENERAL

1-1. Scope.

a. This manual contains instructions for your use in operating and maintaining the Recovery Vehicle, Full Tracked: Medium, M88A1.

b. Two appendixes are located in the back of this manual to aid you in your support of the vehicle.

  (1) Appendix A lists the current references, technical manuals, forms, and other publications which add to these instructions.

  (2) Appendix B lists the components and support items that are supplied with the vehicle for operational maintenance.

c. Instructions on destruction of the vehicle to prevent enemy use are contained in TM 750-244-6, procedures for destruction of Tank-Automotive Equipment to prevent enemy use (U.S. Army Tank-Automotive Command).

1-2. Maintenance Responsibility.

The levels of maintenance responsibilities, as assigned in maintenance allocation charts, are shown in this manual. When the level of repair or adjustment is beyond the operator and crew, the supporting unit will be notified so that the proper personnel and tools are used.

1-3. Maintenance Forms and Records.

Maintenance forms and records that you might use are explained in TM 38-750. For a listing of current maintenance forms and records, refer to DA PAM 310-2. The ones most often required are listed on the following page:

DA Form 2400	Equipment Utilization Report
DA Form 2404	Equipment Inspection and Maintenance Worksheet
DA Form 2407	Maintenance Request Form
DA Form 2408-1	Equipment Daily or Monthly Log
DA Form 2408-14	Uncorrected Fault Record

See figure 1-1 for example.

1-4. Equipment Improvement Report and Maintenance Digest (EIR MD) and Equipment Improvement Report and Maintenance Summary (EIR MS).

The quarterly Equipment Improvement Report and Maintenance Digest TB 43-0001-39 series, contains valuable field information on the equipment covered in this manual. The information in the TB 43-0001-39 series is compiled from some of the Equipment Improvement Reports that you prepared on the vehicles covered in this manual. Many of these articles result from comments, suggestions, and recommendations submitted tc the EIR program.

The TB 43-0001-39 series contains information on equipment improvements, minor alternations, proposed Modification Work Orders (MWO's), warranties (if applicable), actions taken on some of your DA Form 2028's (Recommended Changes to Publications), and advanced information on proposed changes that may affect this manual.

The information will help you in doing your job better and will help in keeping you advised of the latest changes in this manual. Also refer to DA PAM 310-4, Index of Technical Publications, and Appendix A, References of this manual.

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Section II. EQUIPMENT DESCRIPTION

1-5. Purpose, Capabilities and Features.

a. General. The Recovery Vehicle, Full Tracked: Medium, M88A1 is an armored, full track-laying, low silhouette vehicle. It is used for hoisting, winching, and towing operations for tanks and other vehicles. It is equipped to assist in repairing disabled vehicles under general field conditions. The vehicle carries a crew of four: commander, operator, mechanic, and rigger.

NOTE

Refer to FM 20-22, Vehicle Recovery Operations for recovery methods using the vehicle equipment.

b. Major Vehicle Systems and Assemblies.

(1) The M88A1 is powered by a 12 cylinder, diesel engine. The vehicle transmission is a combined transmission, differential, steering and braking unit. Controls for these components are located in the operator's area.

(2) The suspension system for each side consists of 6 roadwheels with support arms, 3 pairs of track support rollers, 3 shock absorbers, 1 track adjusting link, 2 bumper assemblies, track drive sprockets, hubs, compensating idler wheel and track. Primary springing is done by individual torsion bars for each roadwheel arm.

(3) The hull and cab assembly armor protects the crew and equipment against small arms fire, medium artillery, shell fragments and 20 pound anti-tank mines. The vehicle is divided into three sections: crew compartment, hydraulics compartment, and engine compartment.

(4) The vehicle is equipped with a main and an auxiliary hydraulic system used for recovery and maintenance operations. These systems power the spade, boom, main winch, hoist winch, refuel pump and the hydraulic impact wrench.

(5) The vehicle is also equipped with a main and auxiliary generating system. The primary purpose of the auxiliary system is to charge the vehicle batteries when they are too low to start the main engine.

1-6. Description of Major Components

a. Main Winch. Used to pull disabled vehicles during recovery operations.

b. Hoist Winch. Used to lift disabled vehicles and heavy loads for recovery and maintenance operations.

c. Caliber .50 Machinegun. Mounted on cupola to aid crew in case of an enemy attach by personnel, light vehicles and aircraft.

d. Commander's Cupola. Mounts caliber .50 machinegun and allows 360 degree travel of gun. It also provides full vision for commander using six prism blocks mounted in the cupola.

e. Communication Components. Provides equipment for internal and external ground-to-ground communication.

f. Gas-Particulate Filter Unit. Provides filtered breathing air for CB masks used by operator and crew.

g. Personnel Heater. Provides heated air for crew compartment during cold weather operation.

h. Auxiliary Power Unit. Provides electrical power to recharge the batteries. Also provides hydraulic system.

i. Flow Regulator Control. Controls the operation of the fuel transfer pump and the hydraulic impact wrench.

j. M239 Smoke Grenade Kit. Provides a self-screening smoke capability for armored vehicles for concealing maneuvers or vehicle troops.

k. Exhaust Smoke Generating System. Provides a self-screening smoke capability for vehicles with a model AVDS-1790-2DR engine from diesel fuel in the vehicle fuel tanks and is used for concealing maneuvers or vehicle troops.

1-7. Tabulated Data.

a. General.

Armament	one caliber .50 Browning machinegun, M2, heavy barrel, flex; one machinegun mount A555ec38 or A88 two caliber 7.62mm, M14 or 5.56mm, M16; two caliber .45 submachinegun M3A1 with equipment; ten LAW rockets
Crew	4
Engine	Diesel, V12, 4-cycle, air cooled model AVDS-1790-2DR
Transmission	Model XT-1410-4; combination transmission, differential steer and brake system: gears - 3 forward and 1 reverse

Weight:	
Gross (vehicle fully loaded with crew, passengers and payload)	112,000 lb
Net (vehicle with no crew or payload)	105,000 lb
Cargo (crew and maximum payload)	7,000 lb

b. Vehicle.

Dimensions:	
Length	27 ft. 1-1/2 in.
Width	11 ft. 3 in.
Height	10 ft. 3 in.
Ground clearance	17 in.
Ground pressure	10.9 psi
Electrical system:	
Battery power	24 volts dc
Generator power	28±.7 volts dc
Batteries	six 12 volt
Capacities (refill approximate):	
Fuel tanks	400 gal
Main engine crankcase (refill)	16.5 gal
Transmission	17 gal
Main winch	11 gal
Hoist winch	3 gal
Auxiliary power unit	3-1/2 qt
Hydraulic system	95 gal
Mechanical transmission	1 gal

c. Performance.

Vehicle speed (max.)	26 mph
Cruising range	300 miles
Fording depth (max. without kit)	56 in.
Fording depth (max. with kit)	102 in.
Grade ascending ability (max.)	60 percent
Grade descending ability (max.)	60 percent
Vertical obstacle vehicle will climb (forward direction only)	42 in.
Maximum trench crossing width	8 ft. 7 in.
Turning circle (right or left)	pivot
Boom capacity	25 tons
Vehicle hoisting capacity:	
Spade up	6 tons
Spade up (with lockout blocks) - 4-part line	20 tons
Spade down - 4-part line	25 tons

Boom lift height:	
8 ft. reach	22.54 ft.
4 ft. reach	25.125 ft.
Hoist winch:	
Cable size	5/8 in. dia, 200 ft. long
Line pull and speed - 4-part line:	
Bare drum	50,000 lb at 9 fpm
Full drum	30,000 lb at 13 fpm
Main winch:	
Cable size	1-1/4 in. dia, 200 ft. long
Line pull and speed:	
Bare drum	90,000 lb at 20 fpm
Full drum	51,400 lb at 42 fpm
Draw bar pull	90,000 lb
Hydraulic wrench	TM 9-5130-338-15P

d. Periscope.

Periscope M17 (7 included):	
Magnification	1X
Periscope offset	short
Field of view	50 degree vertical 150 degree horizontal
Periscope M24 (2 included):	
Magnification	1X
Periscope offset	8-7/8 in.
Field of view	25 degree vertical 90 degree horizontal

e. Auxiliary Equipment.

Auxiliary power unit:	
Ordnance number	11671652
Type	2 cylinder, 4 cycle, diesel
Horsepower	10.8
Fire extinguisher:	
Portable (2 included):	
Type	carbon dioxide
Capacity:	
Volume	218 cu in.
Weight	5 lb
Weight (fully charged)	15.5 lb
Fixed (2 banks):	
Type	carbon dioxide
Capacity:	
Volume	505 cu in.
Weight	10 lb
Weight (fully charged)	45 lb

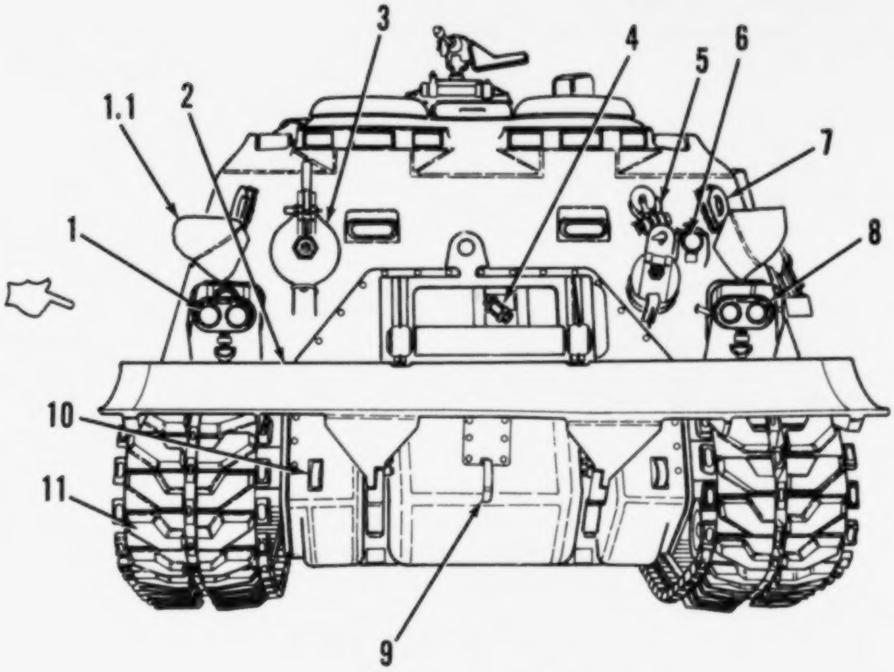
Communication equipment:
  Radio set and interphone, consisting of:
    Radio sets - AN/VRC-44 or AN/VRC-46 or AN/VRC-64
    Suppressor - MX-7778A
    Intercommunications system - AN/VIX-1(V)
    (4 controls)

Smoke grenade equipment (M239) consisting of:
  - Grenade bin
  - Canvas covers
  - Push button unit
  - Dischargers

Exhaust smoke generating system consisting of:
  Modification kit 12275753 (Engine)
  (NSN 2815-01-077-7856)
  Modification kit 1672388 (Hull)
  (NSN 2590-01-084-6051)

1-8. Name Plates.

See figure 1-7 for name plates of the vehicle and its major components.



1. Right light and horn cluster
1.1. Smoke grenade discharger (2)
2. Spade
3. Snatch block, 90-ton
4. Main winch cable opening
5. Snatch block, 25-ton
6. Flasher light
7. Lifting eyes (2)
8. Left light cluster
9. Towing eye
10. Towing lug (2)
11. Track (2)

Figure 1-2. M88A1 - front view.

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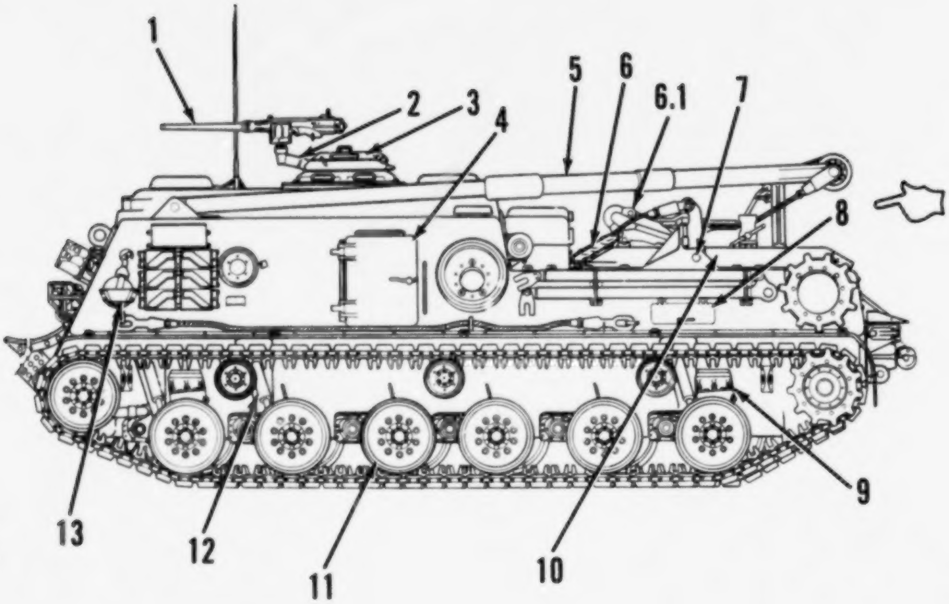

1. Caliber 0.50 machine gun
2. Machine gun mount
3. Commander's cupola
4. Personnel door, left side
5. Boom
6. Tarpaulin and 100-ft rope
6.1. Snatch block, 90-ton
7. Tow bar
8. Left side stowage compartment door
9. Bumper spring (4)
10. Crow bar (2)
11. Roadwheel (12)
12. Shock absorber (6)
13. Snatch block, 10 ton

Figure 1-3. M88A1 - left side view.

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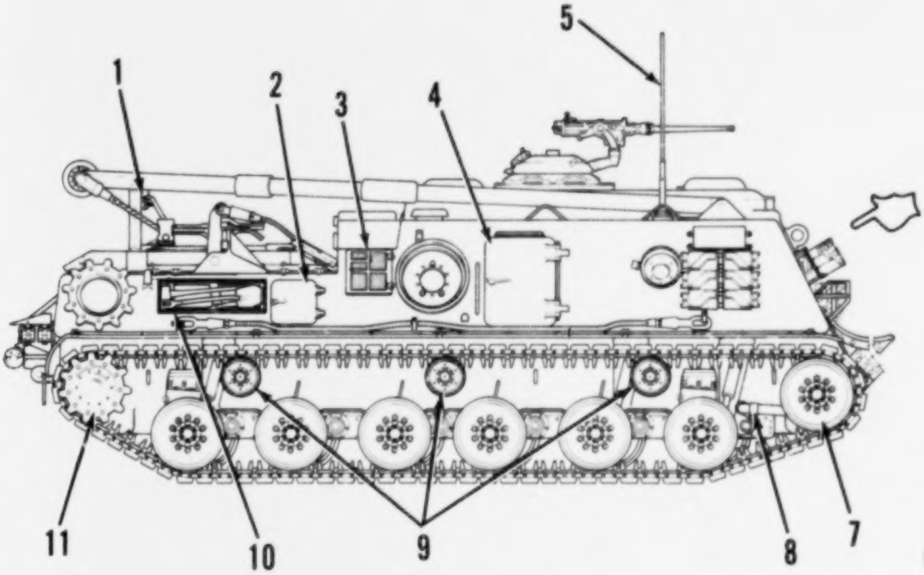

1. Boom support and latch
2. Right stowage compartment
3. Auxiliary power unit compartment door
4. Personnel door, right side
5. Antenna
6. Deleted
7. Compensating idler wheel (2)
8. Track tension adjusting link (2)
9. Track support roller (6)
10. Pioneer tools
11. Drive sprocket (2)

Figure 1-4. M88A1 - right side view.

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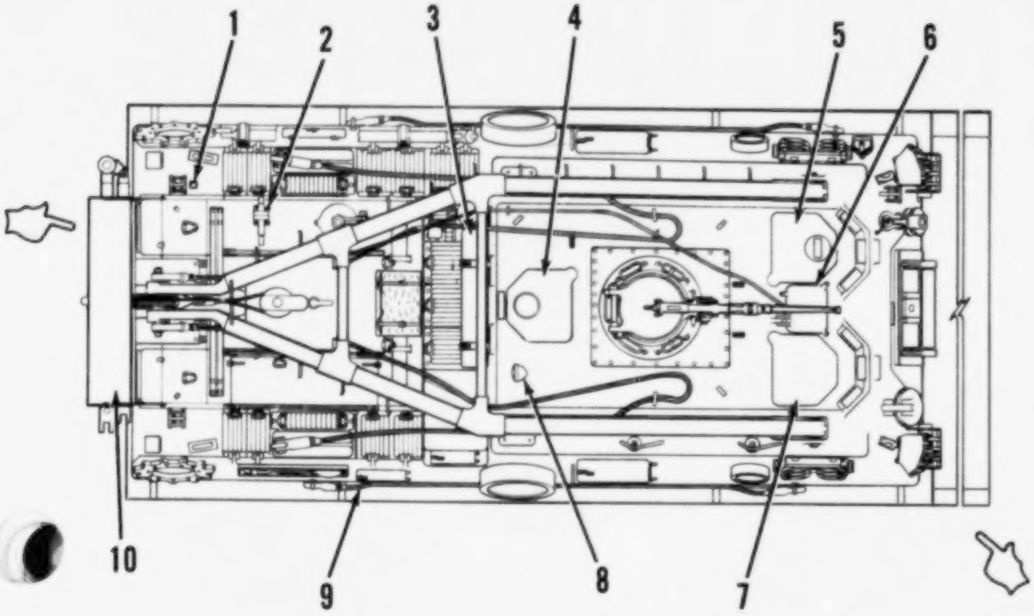

1. Auxiliary power slave receptacle
2. Vise
3. Oxygen cylinder
4. Rigger's hatch
5. Operator's hatch
6. Hoist winch cable access door
7. Mechanic's hatch
8. Spotlight
9. Tow cable (2)
10. Exhaust deflector

Figure 1-5. M88A1 - top view.

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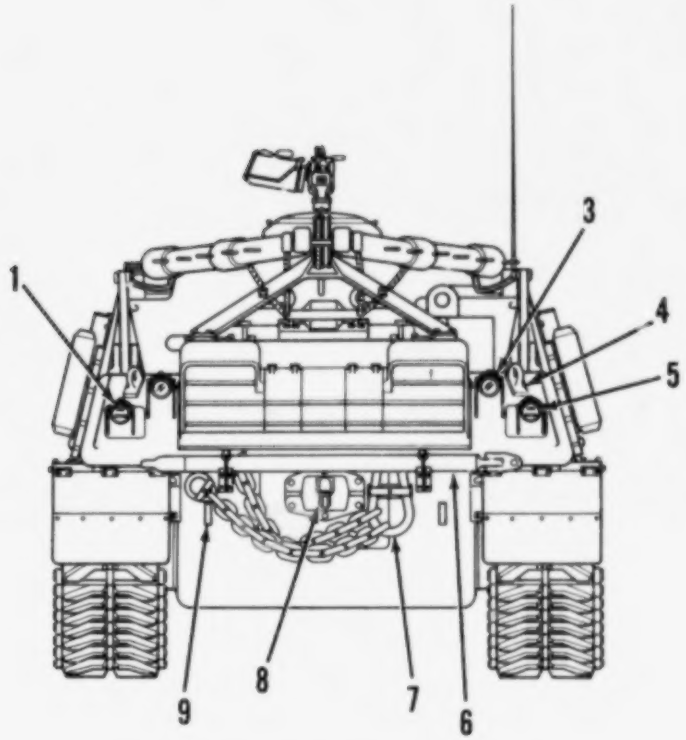

1. Rear taillight
2. DELETED
3. Rigger's light
4. Lifting eye
5. Blackout marker light
6. Tow bar
7. Lifting chain
8. Towing pintle
9. Towing lug

Figure 1-6. M88A1 - rear view.

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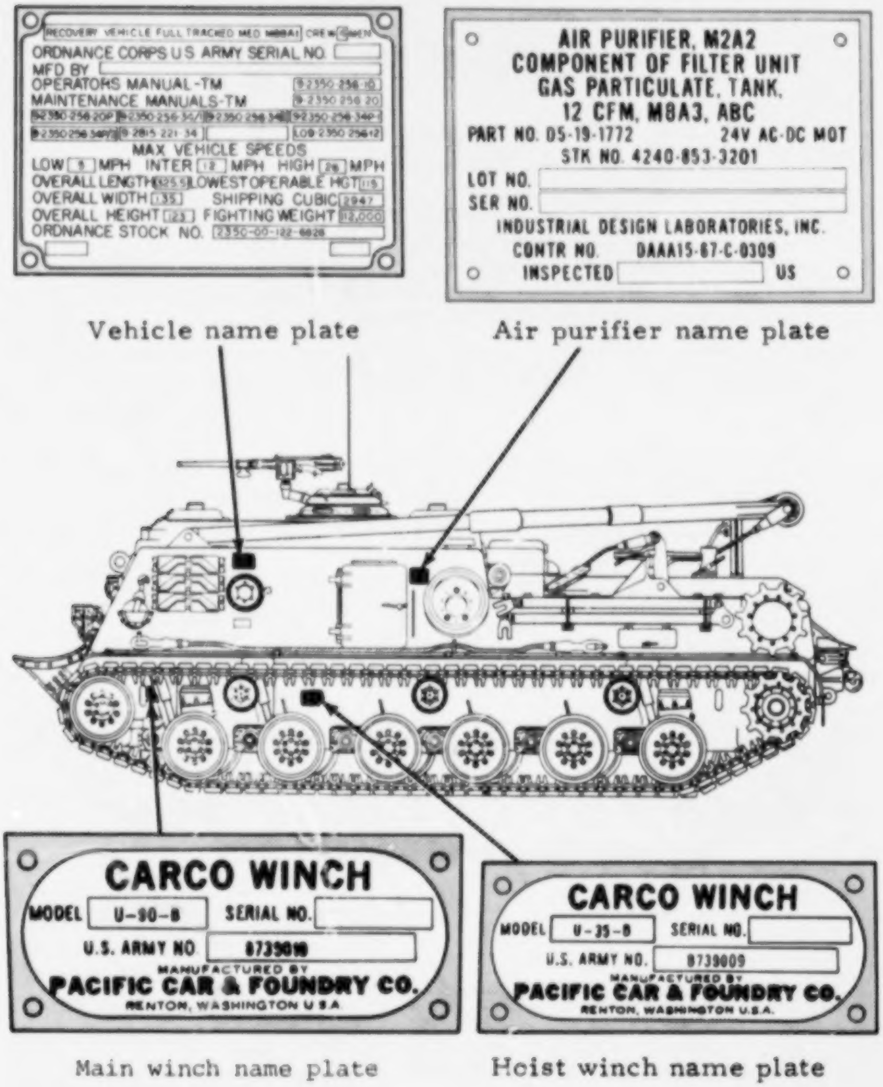
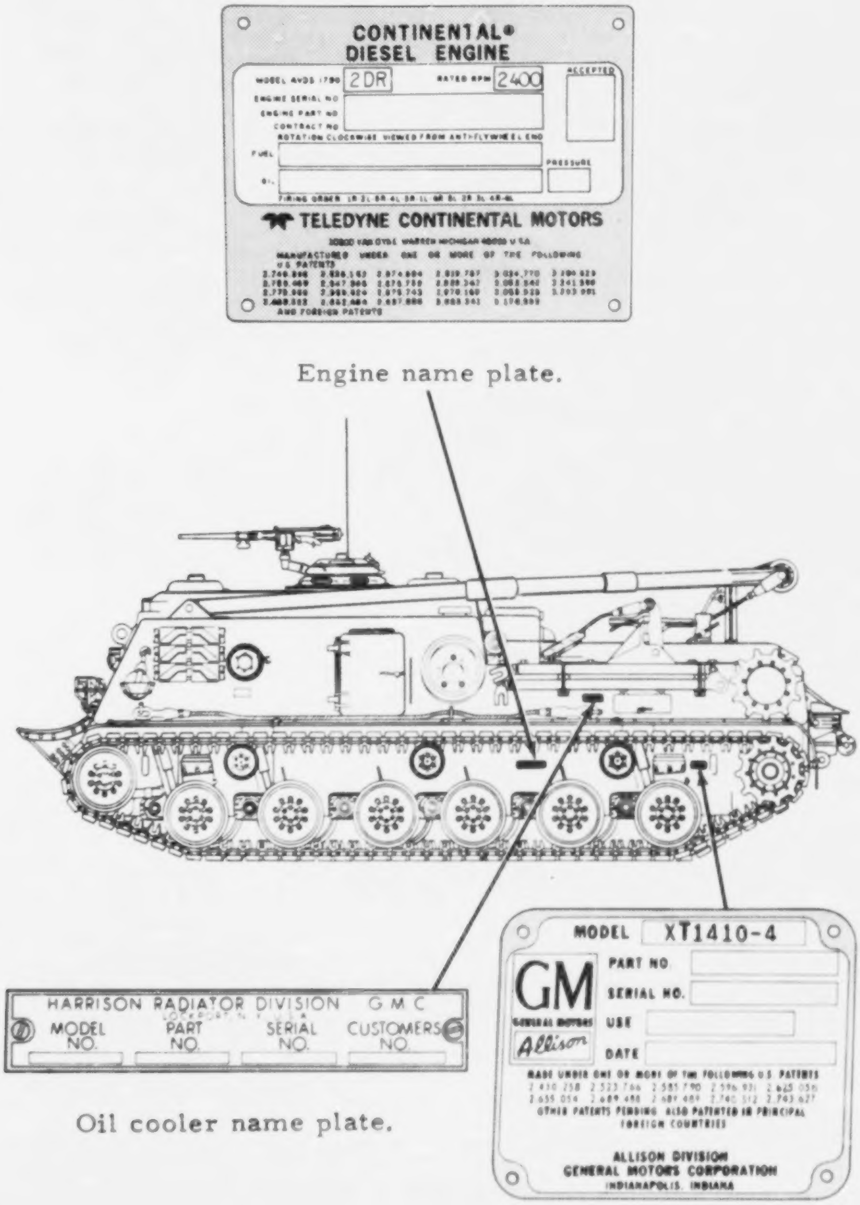

RECOVERY VEHICLE FULL TRACKED MED M88A1 CREW 4 MEN
ORDNANCE CORPS U S ARMY SERIAL NO.
MFD BY
OPERATORS MANUAL-TM 9-2350-256-10
MAINTENANCE MANUALS-TM 9-2350-256-20
9-2350-256-20P 9-2350-256-34 9-2350-256-34P 9-2350-256-34P-1
9-2350-256-34P-2 9-2815-221-34 LO 9-2350-256-12
MAX VEHICLE SPEEDS
LOW 5 MPH INTER 12 MPH HIGH 26 MPH
OVERALL LENGTH 325.5 LOWEST OPERABLE HGT 115
OVERALL WIDTH 135 SHIPPING CUBIC 2947
OVERALL HEIGHT 123 FIGHTING WEIGHT 112,000
ORDNANCE STOCK NO. 2350-00-122-6826
AIR PURIFIER, M2A2
COMPONENT OF FILTER UNIT
GAS PARTICULATE, TANK,
12 CFM, M8A3, ABC
PART NO. 05-19-1772 24V AC-DC MOT
STK NO. 4240-853-3201
LOT NO.
SER NO.
INDUSTRIAL DESIGN LABORATORIES, INC.
CONTR NO. DAAA15-87-C-0309
INSPECTED US
Vehicle name plate
Air purifier name plate
CARCO WINCH
MODEL U-90-B SERIAL NO.
U.S. ARMY NO. 8739010
MANUFACTURED BY
PACIFIC CAR & FOUNDRY CO.
RENTON, WASHINGTON U.S.A.
CARCO WINCH
MODEL U-35-B SERIAL NO.
U.S. ARMY NO. 8739009
MANUFACTURED BY
PACIFIC CAR & FOUNDRY CO.
RENTON, WASHINGTON U.S.A.
Main winch name plate
Hoist winch name plate

TA171222

Figure 1-7. Name plates (Sheet 1 of 2).


CONTINENTAL®
DIESEL ENGINE
MODEL AVDS 1790
2DR
RATED RPM
2400
ACCEPTED
ENGINE SERIAL NO
ENGINE PART NO
CONTRACT NO
ROTATION CLOCKWISE VIEWED FROM ANTI-FLYWHEEL END
FUEL
OIL
PRESSURE
TELEDYNE CONTINENTAL MOTORS
MANUFACTURED UNDER ONE OR MORE OF THE FOLLOWING U.S. PATENTS
AND FOREIGN PATENTS
HARRISON RADIATOR DIVISION G.M.C
LOCKPORT, N.Y. U.S.A.
MODEL NO.
PART NO.
SERIAL NO.
CUSTOMERS NO.
MODEL
XT1410-4
GM
GENERAL MOTORS
Allison
PART NO.
SERIAL NO.
USE
DATE
MADE UNDER ONE OR MORE OF THE FOLLOWING U.S. PATENTS
OTHER PATENTS PENDING. ALSO PATENTED IN PRINCIPAL FOREIGN COUNTRIES
ALLISON DIVISION
GENERAL MOTORS CORPORATION
INDIANAPOLIS, INDIANA

Engine name plate.

Oil cooler name plate.

Transmission name plate.

TA016525

Figure 1-7. Name plates (Sheet 2 of 2).

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. GENERAL

2-1. Description and Content.

a. Chapter 2 contains the instructions which are necessary to operate the M88A1 under usual and unusual conditions. Also included is information on servicing the vehicle when it first arrives, description of controls and instruments, and instructions on operating the auxiliary equipment.

b. An alphabetical index is provided for quick reference to information on controls, instruments and operating procedures found in this chapter.

Index for Operating Instructions

Item	Para.
Access plates - crew compartment floor	2-10
Boom operation	2-21
Caliber .50 machinegun operation	2-18
Checking engine operation	2-12b(2)
Driving precautions	2-15
Fire extinguisher operation	2-32 and 2-33
Fording operations	2-44
Gas-particulate filter unit	2-35
General vehicle controls	2-9
General vehicle services	2-2
Hoist winch operation	2-23
Hydraulic systems preparation	2-19
Jack operation	2-34
Lockout blocks	2-24
Main winch operation	2-25
Operation of auxiliary equipment	2-26
Operations under unusual conditions - cold and hot	2-39
Personnel heater operation	2-30
Prestarting instructions	2-12a
Slave starting - main engine	2-12c
Spade operation	2-20
Starting - main engine by towing	2-12d
Starting - main engine (cold weather)	2-41a

Index for Operating Instructions - Continued

Item	Para.
Starting - main engine (normal weather)	2-12
Starting - vehicle in motion	2-13
Steering	2-13
Stopping - main engine	2-16
Stopping - vehicle	2-14
Towing operations	2-17
Transmission shift selections	2-13
Ventilating blower operation	2-31

Section II. SERVICING THE VEHICLE

2-2. General Services.

When your unit receives a new vehicle, it must be thoroughly checked out. If anything is wrong with the M88A1, record it on DA Form 2404.

2-3. Specific Services.

a. Check the vehicle for completeness of assembly. Make sure that all equipment and controls are present and in good shape.

b. Check the components and support items, supplied with the vehicle, against the Components and Support Items List (CASIL) provided in the back of this manual in appendix B.

c. Perform all before-operation services in the Preventive-Maintenance Checks and Services in table 3-1. Take the vehicle for a short road test of one mile to see that it operates the way it should.

Section III. DESCRIPTION AND USE OF CONTROLS AND INSTRUMENTS

2-4. General.

This section locates and describes the controls and instruments used to operate the M88A1. Figures 2-1 through 2-4 show inside views of the crew compartment.

NOTE

> In this manual, location descriptions of left and right side ALWAYS refer to the left and right side of the operator's driving position.

2-5. Operator's Controls and Instruments.

See figure 2-5.

2-6. Mechanic's (Assistant Operators) Controls.

The mechanic's (assistant operator) seat controls, interphone control box and hatch control are the same as the operator's. See figure 2-5 for instructions.

2-7. Commander's Controls.

See figure 2-6.

2-8. Rigger's Controls.

See figure 2-7.

NOTE

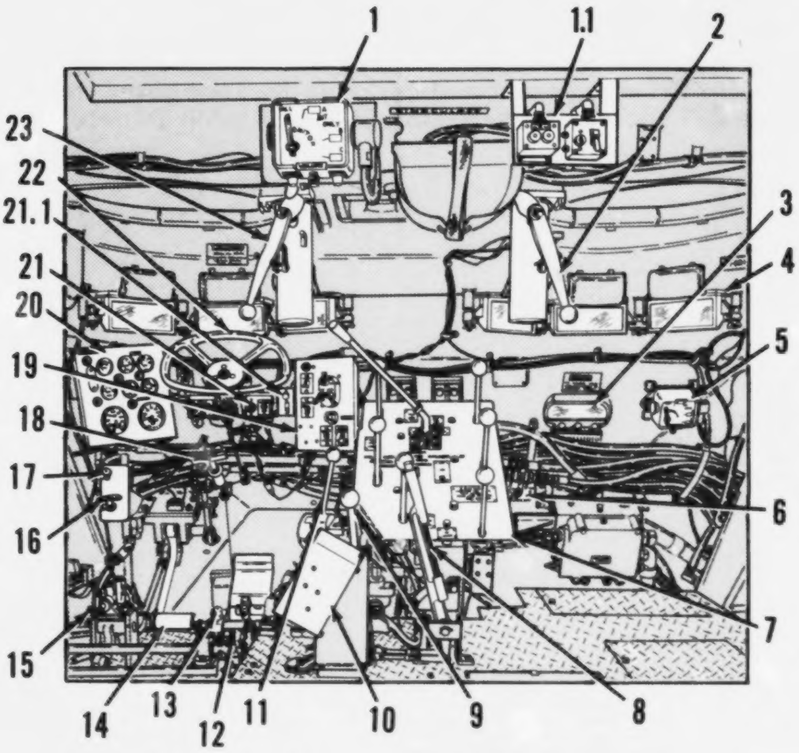
> Refer to paragraph 4-2 for interphone control box operations. Rigger's hatch control operates like the operator's (fig. 2-5, sheet 2). The seat controls operate like the commander's (fig. 2-6).

2-9. General Vehicle Controls.

There are many other controls which aid in the normal operation of the vehicle. See figure 2-8 for their operating instructions and locations.

2-10. Access Plates.

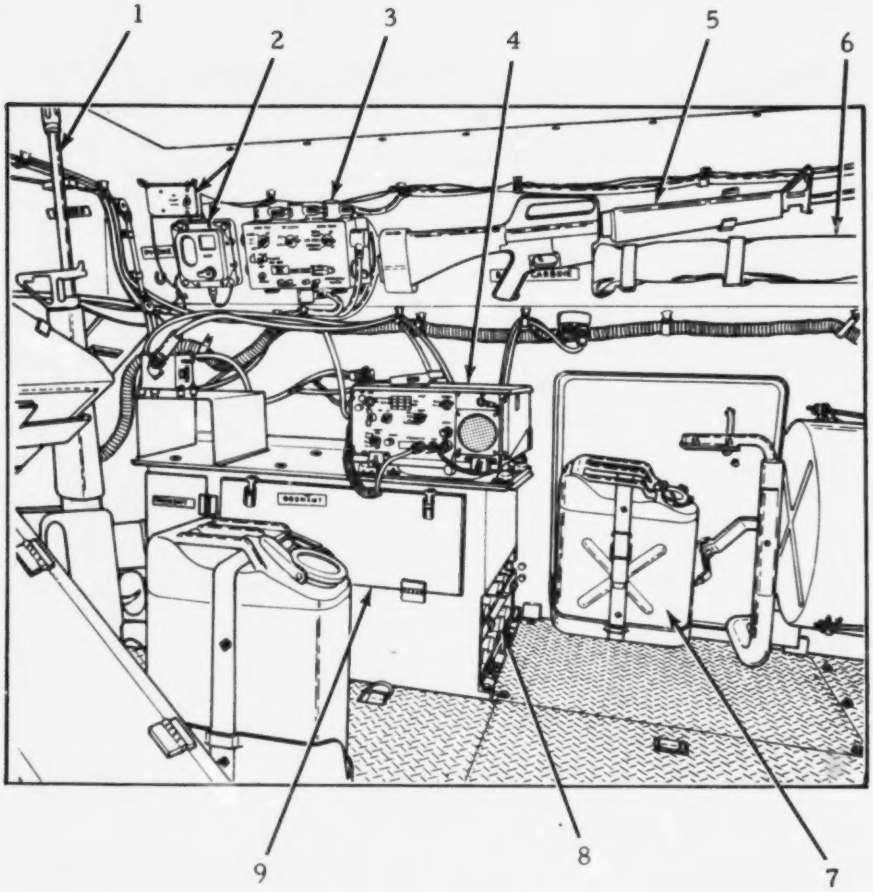
The floor of the crew compartment is made up of separate plates and doors. They may be removed for access to the equipment and controls located below them. Figure 2-9 locates these items and tells what is below each one.



1. Commander's interphone control box
1.1. M239 smoke grenade arming switch
2. Mechanic's hatch control
3. Operator's and mechanic's vision blocks
4. M17 periscope (6 shown)
5. Mechanic's interphone control box
6. APU emergency winch control valve
7. Hydraulic controls panel
8. Drain valve lever
9. Main winch shift lever
10. Auxiliary power unit
11. Transmission shift lever
12. Accelerator
13. Dimmer switch
14. Brake pedal
15. Purge pedal
16. Manual fuel shutoff handle
17. Engine hand throttle
18. Spade locking release handle
19. Switch panel
20. Gage panel
21. B.O. receiver light switch and indicator light
21.1. Vehicle exhaust smoke switch and indicator light
22. Steering wheel
23. Operator's hatch control

TA171270

Figure 2-1. Crew compartment - front view.



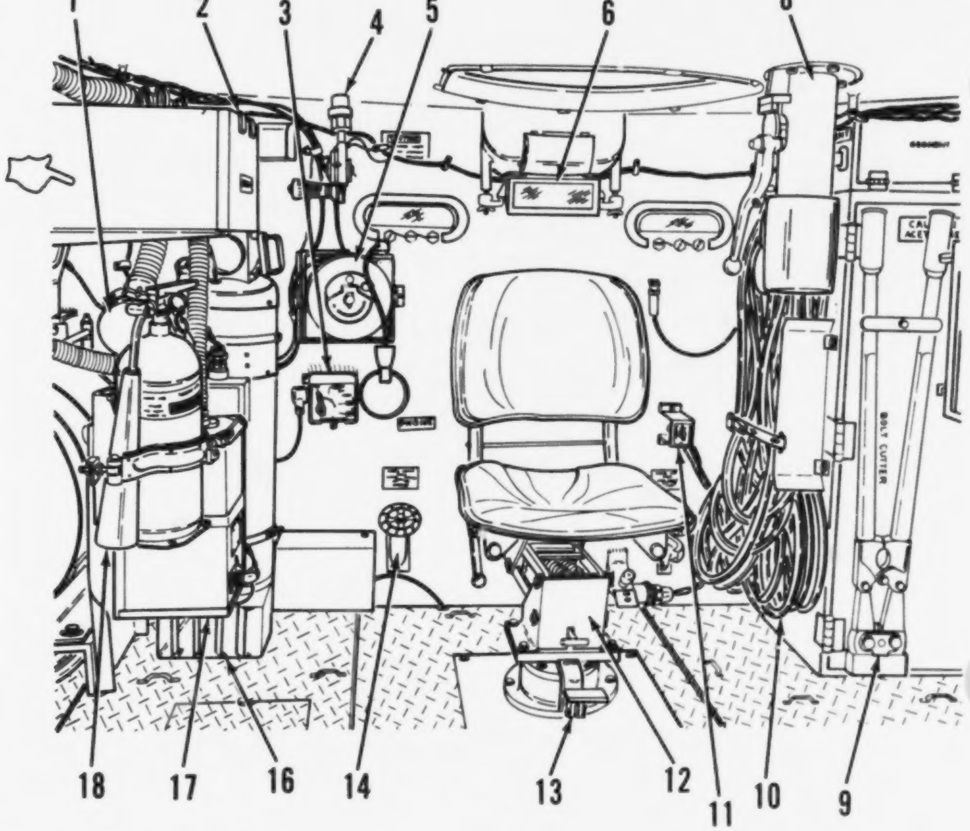
1. M16 rifle (M14 optional)
2. Mechanic's air purifier control switch and dome light

3 Communication amplifier AM1780/VRC

4. Radio equipment
5. M16 rifle (M14 optional)
6. Spare barrel for cal. 50 machinegun
7. Oil can (2)
8. LAW rocket (8)
9. Oddment compartments

TA16531

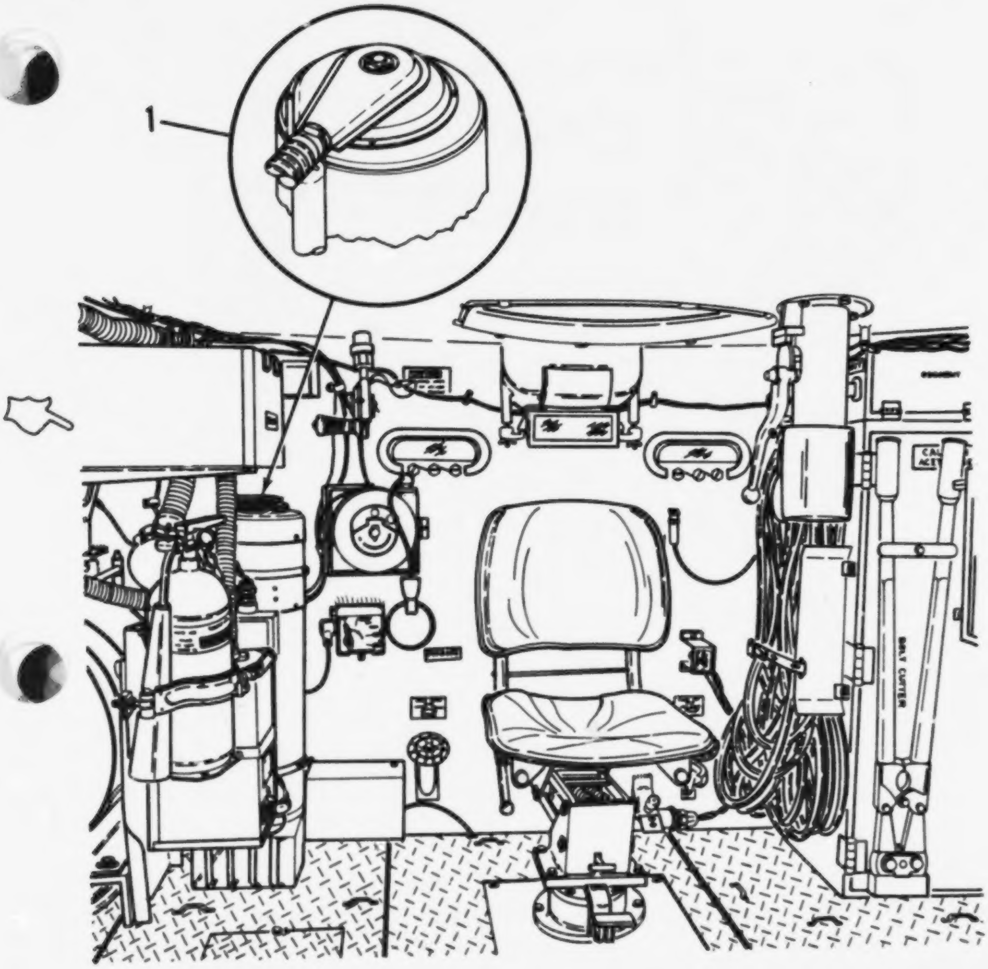
Figure 2-2. Crew compartment - right side.



1. Auxiliary power unit air filter housing
2. M24 periscope stowage box
3. Rigger's interphone control box
4. Rigger's spotlight remote control
5. Rigger's trouble light
6. M17 periscope
7. DELETED
8. Rigger's hatch control
9. Bolt cutter
10. Oxygen and acetylene hoses
11. Rigger's lights
12. Generator blower air intake grille (on bottom of wall, behind rigger's seat-hidden)
13. Rigger's seat
14. Fuel control valve (4)
15. DELETED
16. Personnel heater
17. Gas-particulate filter unit
18. Portable fire extinguisher

Figure 2-3. Crew compartment - rear view.

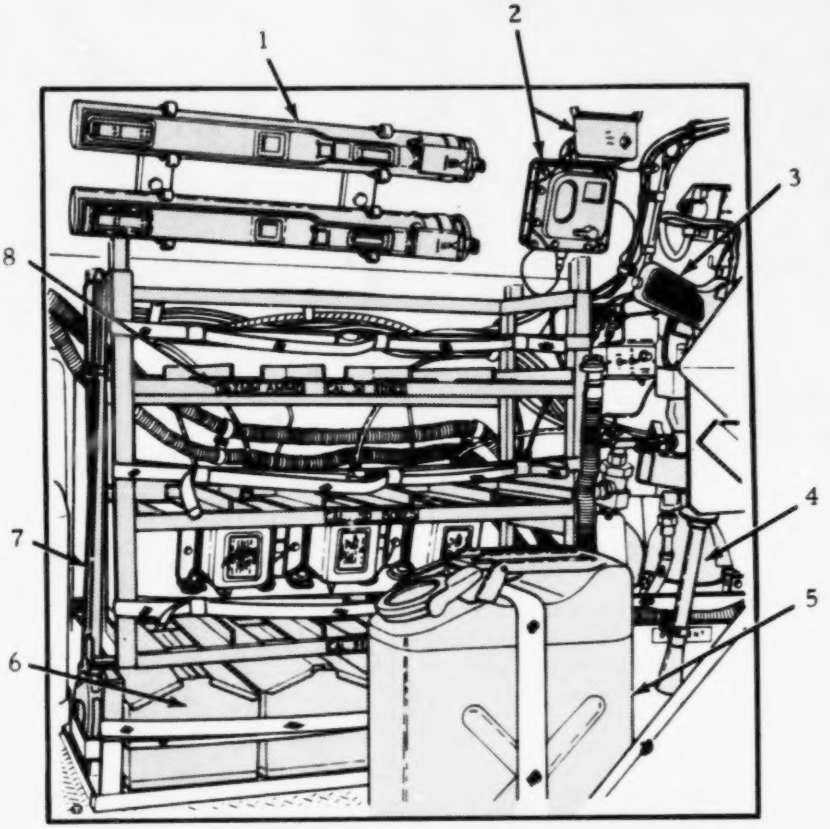
TA171579



1. Optional personnel heater

Figure 2-3.1. Crew compartment - rear view.

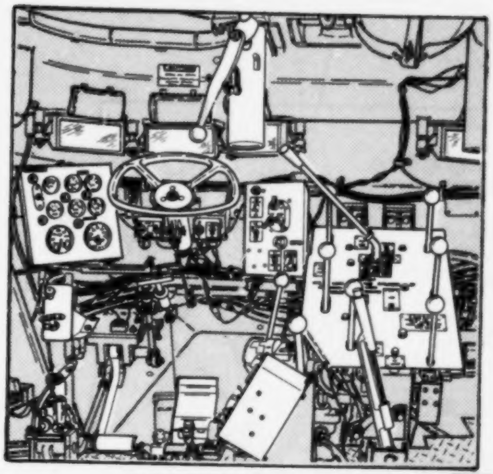
TA171580



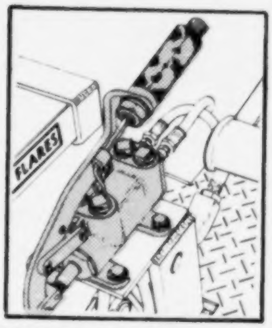
1. LAW rocket (2)
2. Operator's air purifier control switch and dome light
3. Caliber 45 machinegun
4. Fixed fire extinguisher (2 banks-4 cylinders each)
5. Water can (2)
6. Tool box
7. Track link adjusting wrench
8. Ammunition stowage rack

TA016533

Figure 2-4. Crew compartment-left side.

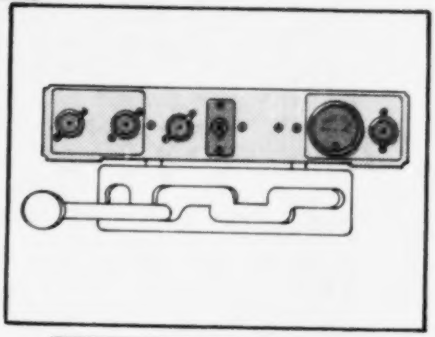


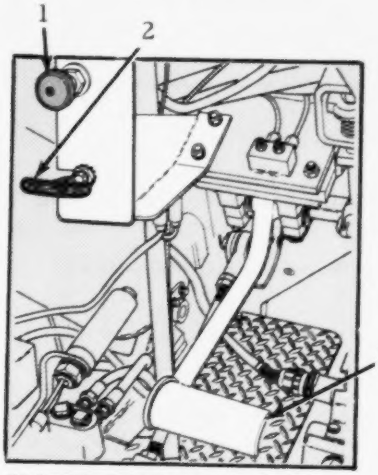
DRIVER'S AREA



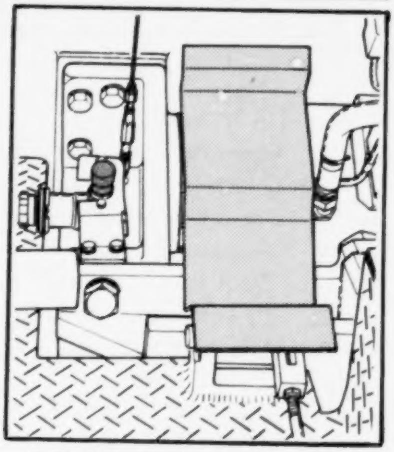
PURGE PUMP. See fig. 2-11 and 2-44 for operation.

TRANSMISSION SHIFT SELECTOR AND PANEL CONTAINING FIRE EXTINGUISHER ENGINE SHUT OFF ACTIVATED LIGHT, PTO ENGAGED LIGHT, FLASHER LIGHT, AND SWITCH, HYDRAULIC OIL TEMPERATURE GAGE AND LIGHT. See fig. 2-16 for shift operation.





HAND THROTTLE (1) FUEL SHUTOFF HANDLE (2) AND BRAKE (3).



DIMMER SWITCH AND ACCELERATOR.

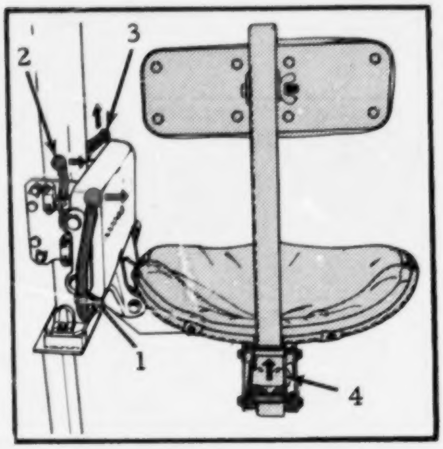
TA171223

Figure 2-5. Operator's controls and instruments (Sheet 1 of 12).

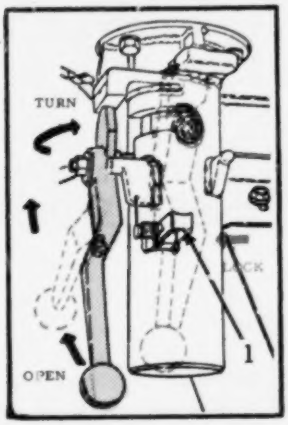
NOTE

Have weight on seat when doing steps 2, 3, and 4.

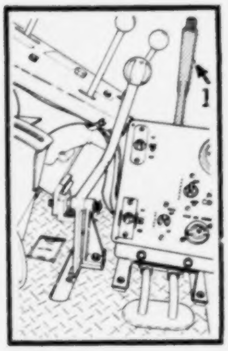
1. Pull lever (1) to dump seat. Stand clear.
2. Pull lever (2) to move seat forward or backward.
3. Lift lever (3) to adjust seat height.
4. Lift locking lever (4) to adjust backrest.



OPEPATOR 'S SEAT CONTROLS.



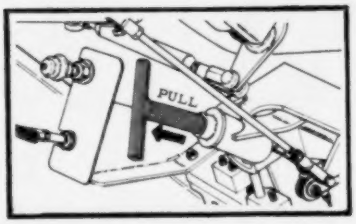
HATCH CONTROL.



DRAIN VALVE LEVER
(1) Depress button to unlock lever. Pull to open valves. Push to close.

WARNING

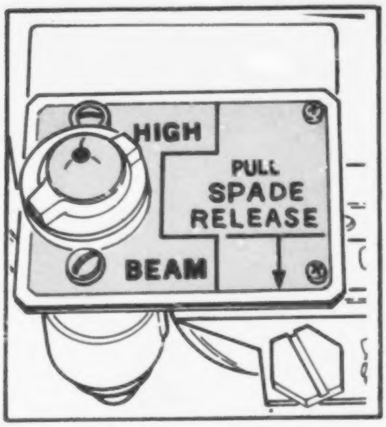
Secure handle with locking tang (1) while operating vehicle with hatches open.



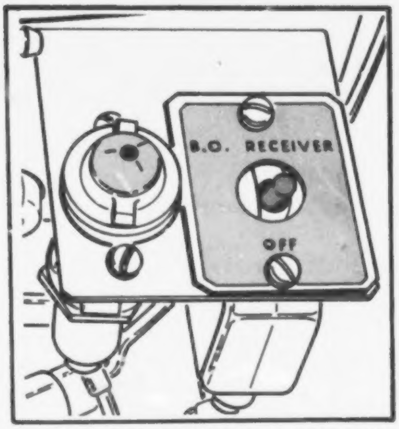
SPADE LOCKING HANDLE.

TA016535

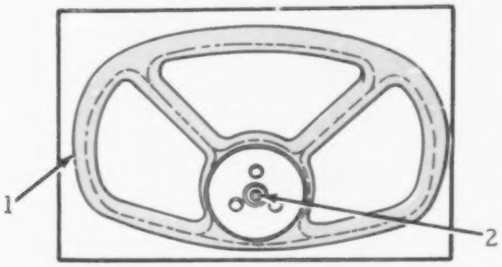
Figure 2-5. Operator's controls and instruments (Sheet 2 of 12).


HIGH
BEAM
PULL
SPADE
RELEASE

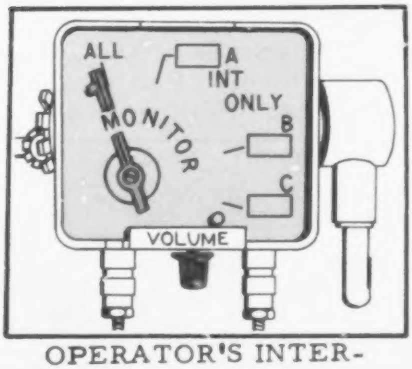
HIGH BEAM INDICATOR. Glows when infrared and service headlights are on and dimmer switch is depressed for high beam.


B.O. RECEIVER
OFF

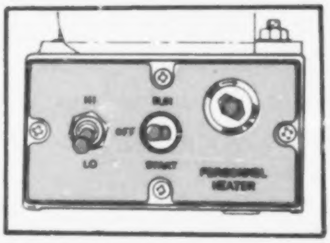
B.O. RECEIVER SWITCH. To operate - turn master switch ON. Hook up M24 periscope and turn switch to B.O. RECEIVER.



STEERING WHEEL (1) AND HORN BUTTON (2).


ALL
A
INT
ONLY
B
C
MONITOR
VOLUME

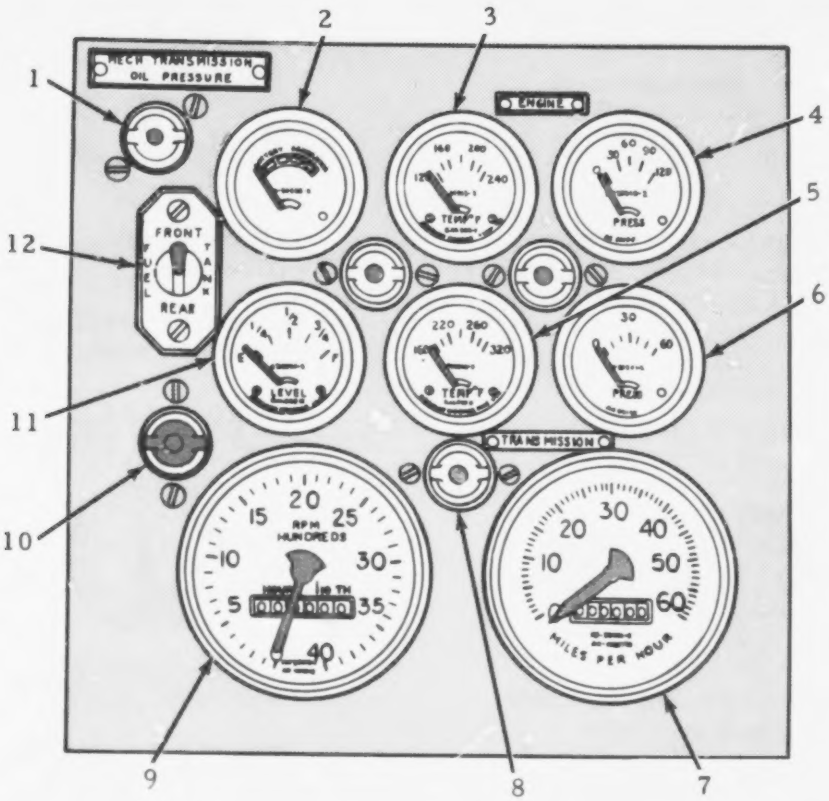
OPERATOR'S INTERPHONE CONTROL BOX. See para. 4-2 for operation.


HI
RUN
OFF
LO
START
PERSONNEL HEATER

PERSONNEL HEATER CONTROL BOX. Located left of operator's shoulder. See fig. 2-37 for operation instructions.

Figure 2-5 Operator's controls and instruments (Sheet 3 of 12).

TA100371


1
2
3
4
5
6
7
8
9
10
11
12
MECH TRANSMISSION OIL PRESSURE
ENGINE
TRANSMISSION
FRONT
FUEL
TANK
REAR
120 160 200 240
TEMP
30 60 90 120
PRESS
E 1/4 1/2 3/4 F
LEVEL
160 220 260 320
TEMP
30 60
PRES
5 10 15 20 25 30 35 40
RPM HUNDREDS
10 20 30 40 50 60
MILES PER HOUR

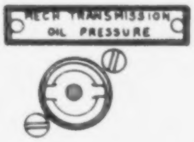
GAGE PANEL

1. Mechanical transmission low oil pressure warning light
2. Battery-generator indicator: battery when engine is off-generator when engine is running
3. Engine oil temperature gage
4. Engine oil pressure gage
5. Transmission oil temperature gage
6. Transmission oil pressure gage
7. Speedometer
8. Panel lamp assembly (3)
9. Tachometer-shows engine rpm in divisions of 100
10. Master warning light
11. Fuel level gage-for front and rear tanks
12. Fuel level gage selector switch

TA016537

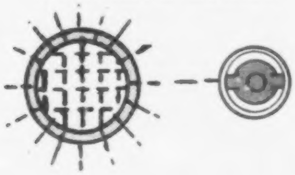
Figure 2-5. Operator's controls and instruments (Sheet 4 of 12).

MECHANICAL TRANSMISSION WARNING LIGHT



Lights when mechanical transmission oil pressure is 4 psi or less

HORN AND MASTER WARNING LIGHT



Master warning light and horn come on when:

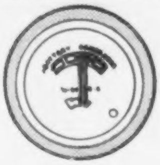
a. Engine oil temperature is 245° ± 5° F.

b. Engine oil pressure is less than 13 psi on start or less than 9 psi when running.

c. Transmission oil temperature is 285° ± 5° F.

d. Light is on when master switch is ON with engine off.

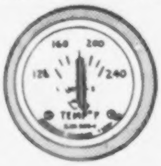
BATTERY-GENERATOR



Battery reading- mid yellow zone.

Generator reading- mid green zone.

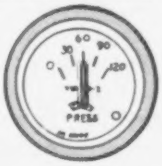
ENGINE OIL TEMPERATURE



Normal operating range-140° - 240° F.

Danger zone-245° ± 5° F.

ENGINE OIL PRESSURE



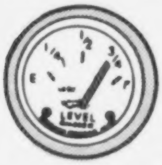
Normal operating range-40-70 psi at 2400, Idle - 15 psi.

Danger zone less than 9 psi.

TA016538

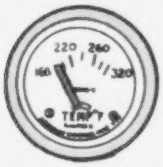
Figure 2-5. Operator's controls and instruments (Sheet 5 of 12).

FUEL LEVEL


E
1/4
1/2
3/4
F
LEVEL

Shows selected fuel tank level-front or rear.

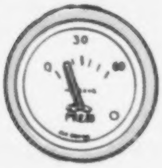
TRANSMISSION OIL TEMPERATURE


160
220
280
320
TEMP

Normal operating range-160° -280°F.

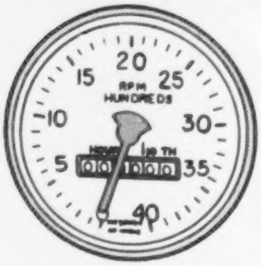
Danger zone-285° ± 5° F.

TRANSMISSION OIL PRESSURE


0
30
60
PRESS

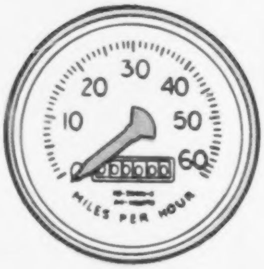
Normal operating range-17 ± 2 psi
Idle-5 psi.

TACHOMETER


5
10
15
20
25
30
35
40
RPM HUNDREDS
HOURS
1/10 TH

Low idle-675-725 rpm.
High idle-2,400-2,640 rpm.
Hydraulic settings:
Turn on at low idle, operate at 1,800 rpm.

SPEEDOMETER


0
10
20
30
40
50
60
MILES PER HOUR

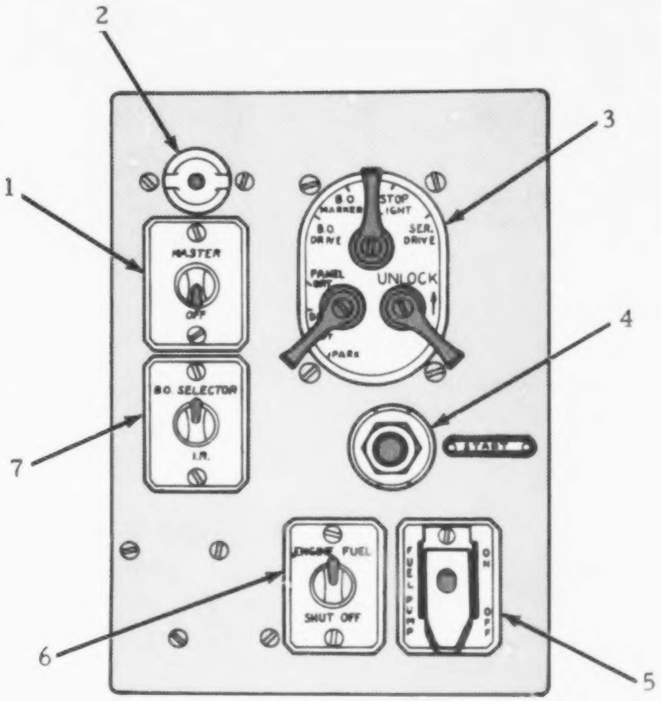
1st gear - 0-5 mph.
2nd gear - 5-12 mph.
3rd gear - 12-26 mph.

CAUTION

Do not allow engine to run above 2,640 rpm for more than 2-3 seconds at high idle.

TA016539

Figure 2-5. Operator's controls and instruments (Sheet 6 of 12).

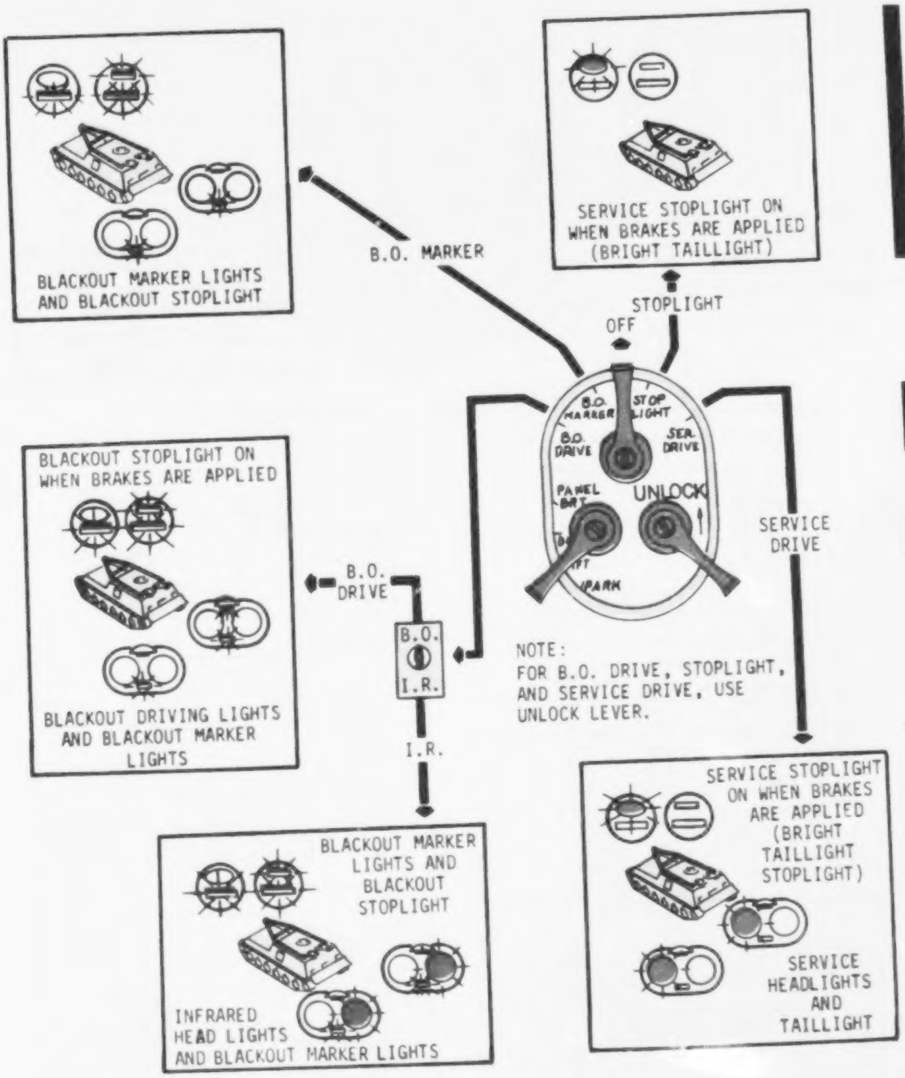

2
1
3
MASTER
OFF
B.O. STOP
MARKER LIGHT
B.O. DRIVE
SER. DRIVE
PANEL LIGHT
UNLOCK
PARK
4
B.O. SELECTOR
I.R.
7
START
ENGINE FUEL
SHUT OFF
FUEL PUMP
ON
OFF
6
5

SWITCH PANEL

1. Master switch - turns on vehicle electrical power (batteries)
2. Master switch indicator light - on when master switch is on
3. Vehicular lights switch
4. Start button
5. Fuel pump switch - generally left ON
6. Engine fuel shutoff switch - used to stop engine
7. Blackout drive and infrared selector switch

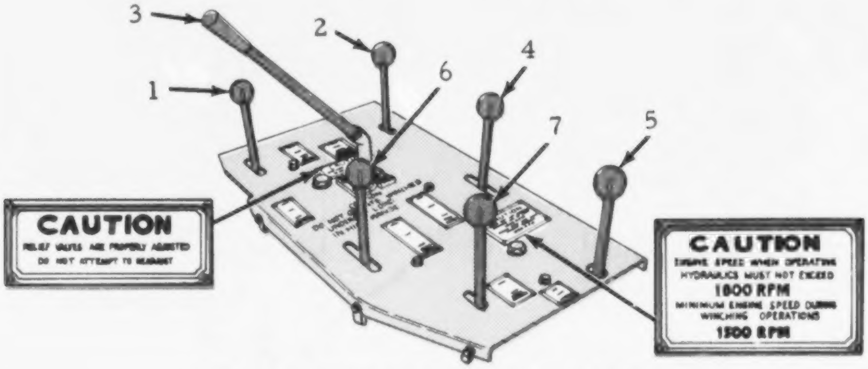
TA016540

Figure 2-5. Operator's controls and instruments (Sheet 7 of 12).

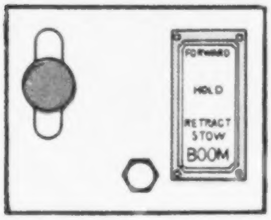

BLACKOUT MARKER LIGHTS AND BLACKOUT STOPLIGHT
B.O. MARKER
SERVICE STOPLIGHT ON WHEN BRAKES ARE APPLIED (BRIGHT TAILLIGHT)
STOPLIGHT
OFF
B.O. MARKER
STOP LIGHT
B.O. DRIVE
SER. DRIVE
PANEL BRT
UNLOCK
PARK
SERVICE DRIVE
BLACKOUT STOPLIGHT ON WHEN BRAKES ARE APPLIED
B.O. DRIVE
B.O.
I.R.
BLACKOUT DRIVING LIGHTS AND BLACKOUT MARKER LIGHTS
I.R.
NOTE:
FOR B.O. DRIVE, STOPLIGHT, AND SERVICE DRIVE, USE UNLOCK LEVER.
BLACKOUT MARKER LIGHTS AND BLACKOUT STOPLIGHT
INFRARED HEAD LIGHTS AND BLACKOUT MARKER LIGHTS
SERVICE STOPLIGHT ON WHEN BRAKES ARE APPLIED (BRIGHT TAILLIGHT STOPLIGHT)
SERVICE HEADLIGHTS AND TAILLIGHT

TA171224

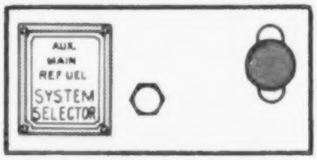
Figure 2-5. Operator's controls and instruments (Sheet 8 of 12).


1
2
3
4
5
6
7
CAUTION
RELIEF VALVES ARE PROPERLY ADJUSTED
DO NOT ATTEMPT TO READJUST
CAUTION
ENGINE SPEED WHEN OPERATING
HYDRAULICS MUST NOT EXCEED
1800 RPM
MINIMUM ENGINE SPEED DURING
WINCHING OPERATIONS
1500 RPM

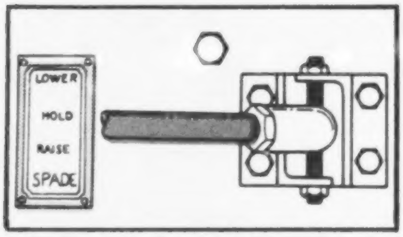
HYDRAULIC CONTROLS PANEL


FORWARD
HOLD
RETRACT
STOW
BOOM

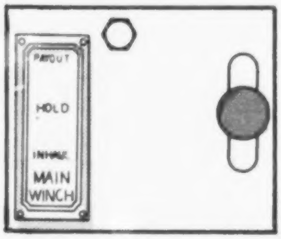
1. BOOM OPERATING LEVER. Used to move boom up or FORWARD, HOLD or RETRACT-STOW. It is spring loaded to stay in HOLD.


AUX.
MAIN
REFUEL
SYSTEM
SELECTOR

2. SYSTEM SELECTOR CONTROL LEVER. Selects auxiliary and main hydraulic systems. REFUEL position for refuel-defuel operations. It locks in each desired position.


LOWER
HOLD
RAISE
SPADE

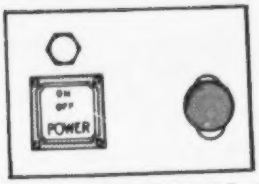
3. SPADE OPERATING LEVER. Used to RAISE, LOWER and HOLD spade. It is spring loaded to stay in HOLD position.


PAYOUT
HOLD
INHAUL
MAIN
WINCH

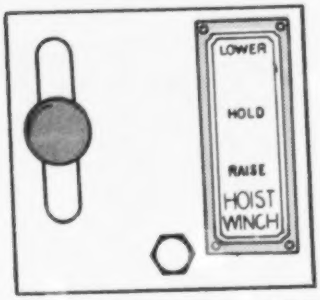
4. MAIN WINCH OPERATING LEVER. Selects PAYOUT, HOLD and INHAUL of main winch cable. Spring loaded to stay in HOLD position.

TA016542

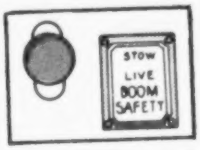
Figure 2-5. Operator's controls and instruments (Sheet 9 of 12).


ON
OFF
POWER

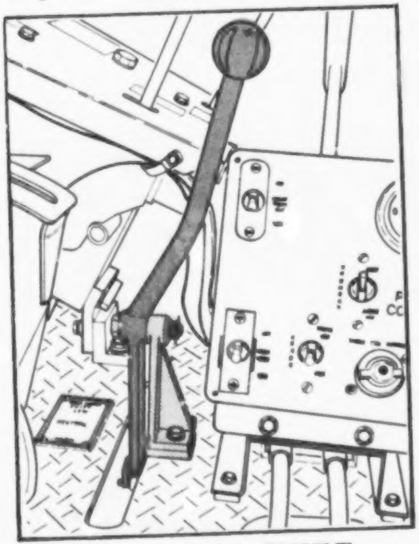
5. POWER CONTROL LEVER. To turn main hydraulic pump ON or OFF. It locks in desired position.


LOWER
HOLD
RAISE
HOIST WINCH

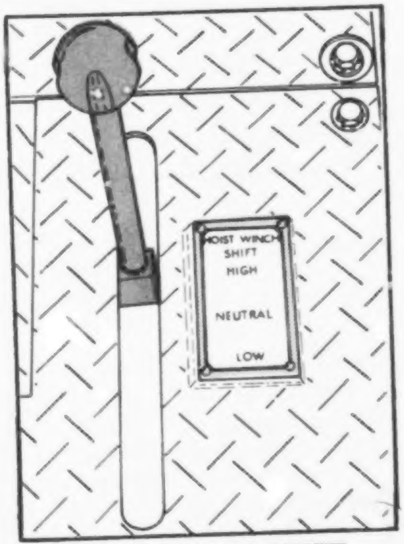
6. HOIST WINCH OPERATING LEVER. Selects LOWER, HOLD and RAISE for hoist cable. Spring loaded to stay in HOLD position.


STOW
LIVE
BOOM SAFETY

7. BOOM SAFETY CONTROL LEVER. Selects STOW or LIVE. Spring loaded to stay in LIVE position.



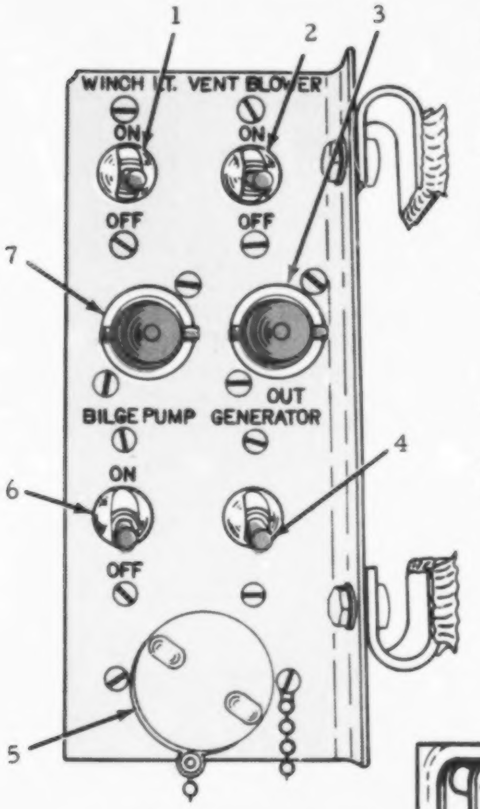
8. MAIN WINCH SHIFT LEVER. Selects LOW, NEUTRAL, or HIGH main winching speeds. It locks in desired position.


HOIST WINCH SHIFT
HIGH
NEUTRAL
LOW

9. HOIST WINCH SHIFT LEVER. Selects LOW, NEUTRAL, or HIGH hoisting speeds. It locks in desired position. Located right rear of driver on floor.

TA171225

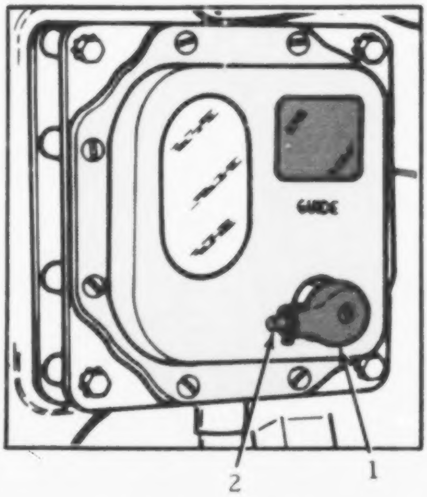
Figure 2-5. Operator's controls and instruments (Sheet 10 of 12).


1
2
3
WINCH LT.
VENT BLOWER
ON
OFF
ON
OFF
7
BILGE PUMP
OUT
GENERATOR
4
6
ON
OFF
5

1. Winch compartment light switch.
2. Ventilating blower switch.
3. Main engine generator out indicator light (OFF when GENERATOR switch (4) is down).
4. Main engine generator switch - will always be left on (down).
5. Utility power receptacle.
6. Bilge pump switch.
7. Bilge pump indicator light - glows when bilge pump is on.

ACCESSORIES PANEL.

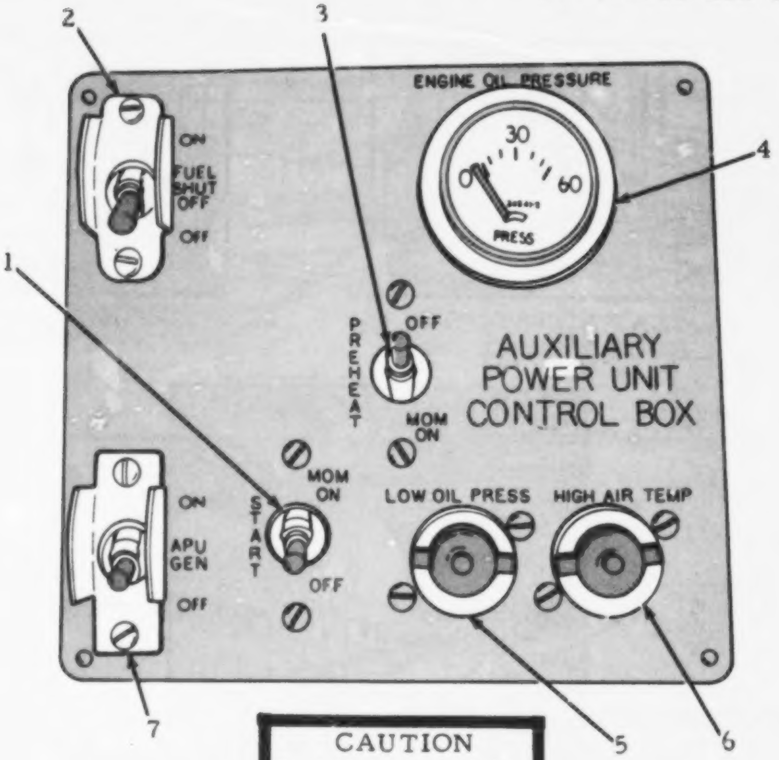
1. Red light ON - Turn lever (1) up.
2. White light ON - Push in safety button (2). Turn lever (1) down.
3. Dome light OFF
   a. Down to stop if on red.
   b. Push button in and turn lever up to top of stop if on white.



DOME LIGHT.

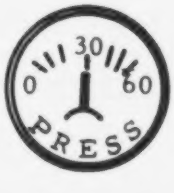
TA016544

Figure 2-5. Operator's controls and instruments (Sheet 11 of 12).


2
3
ENGINE OIL PRESSURE
30
0
60
PRESS
4
ON
FUEL SHUT OFF
OFF
1
PREHEAT
OFF
MOM ON
AUXILIARY POWER UNIT CONTROL BOX
MOM ON
START
OFF
LOW OIL PRESS
HIGH AIR TEMP
ON
APU GEN
OFF
7
5
6

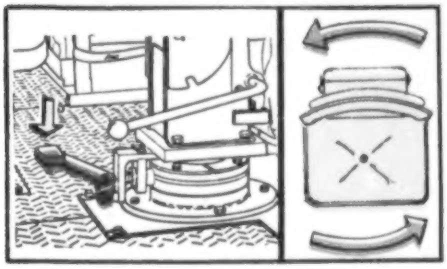
CAUTION
Before operating vehicle fuel control valve forward tank must be closed.

1. APU start switch
2. Fuel shutoff switch
3. Preheat switch
4. Engine oil pressure gage-normal operating pressure is 25-36 psi
5. Low oil pressure light
6. High air temperature light
7. APU generator switch

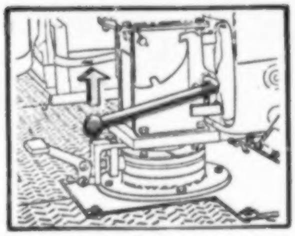

0
30
60
PRESS

TA125588

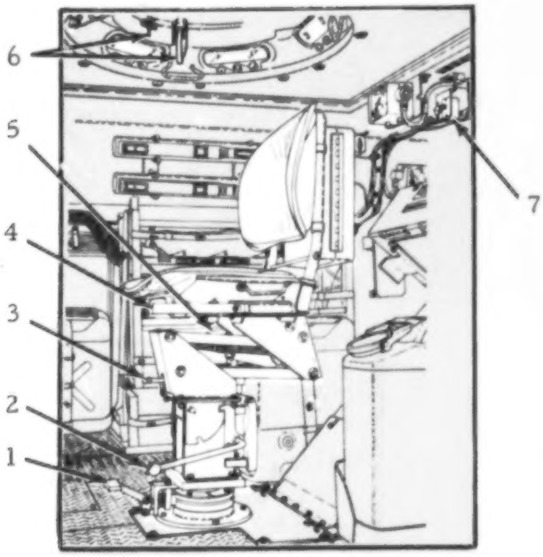
Figure 2-5. Operator's controls and instruments (Sheet 12 of 12).



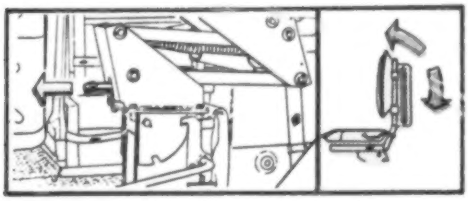
1. SEAT ROTATING FOOT PEDAL.



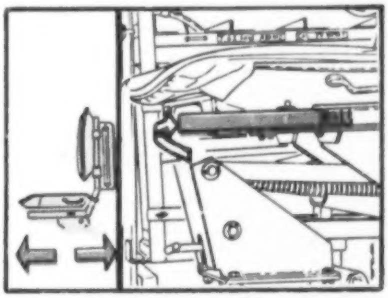
2. DUMPING HANDLE.



COMMANDER'S AREA.



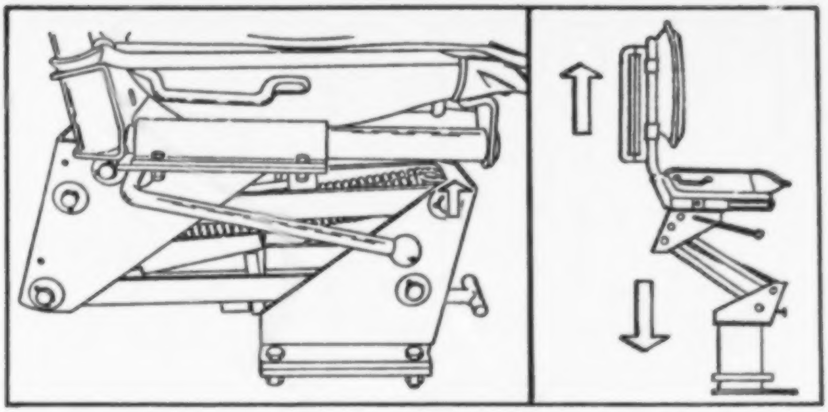
3. TILT HANDLE. Have weight on seat back.



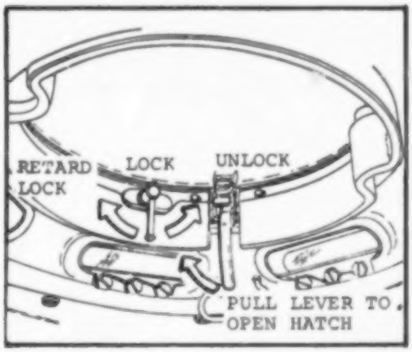
4. SEAT HORIZONTAL ADJUSTMENT. Have weight on seat.

TA016546

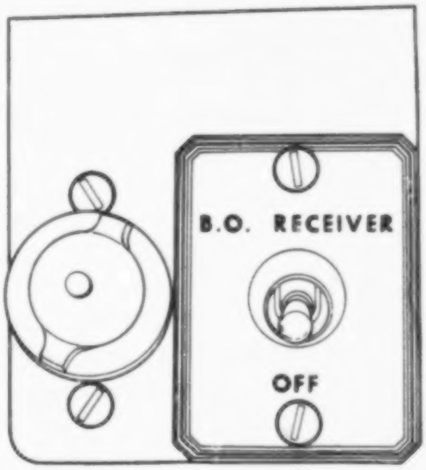
Figure 2-6. Commander's controls (Sheet 1 of 2).



5. SEAT HEIGHT CONTROL. Sit in seat while adjusting.


RETARD LOCK
LOCK
UNLOCK
PULL LEVER TO OPEN HATCH

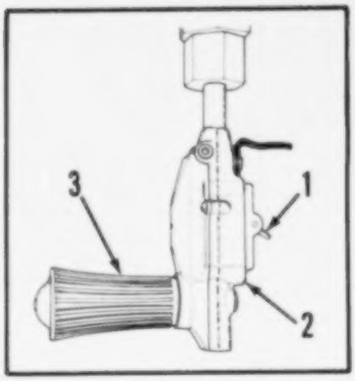
6. COMMANDER'S CUPOLA CONTROLS.

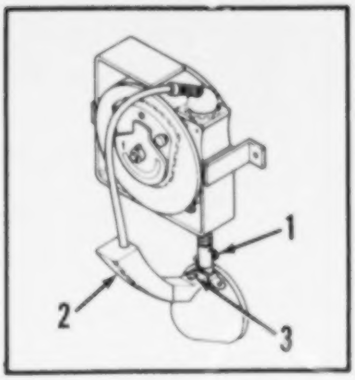

B.O. RECEIVER
OFF

7. COMMANDER'S BLACKOUT RECEIVER SWITCH AND INDICATOR LIGHT.
   - a. Hook up power cable (fig. 3-10) to infrared vision device.
   - b. Turn MASTER switch ON.
   - c. Turn B. O. RECEIVER switch ON. Indicator light will glow.

TA016547

Figure 2-6. Commander's controls (Sheet 2 of 2).





1. OUTSIDE SPOTLIGHT CONTROL.
   - a. To operate, turn on master switch and push switch (1) up.
   - b. Rotate control (2) to turn light.
   - c. Turn handle (3) to raise or lower light.

2. TROUBLE LIGHT.
   - a. To use, loosen knurled head screw (1) and remove from holder by holding hand grip (2).
   - b. To operate, press ON-OFF switch (3) on hand grip.

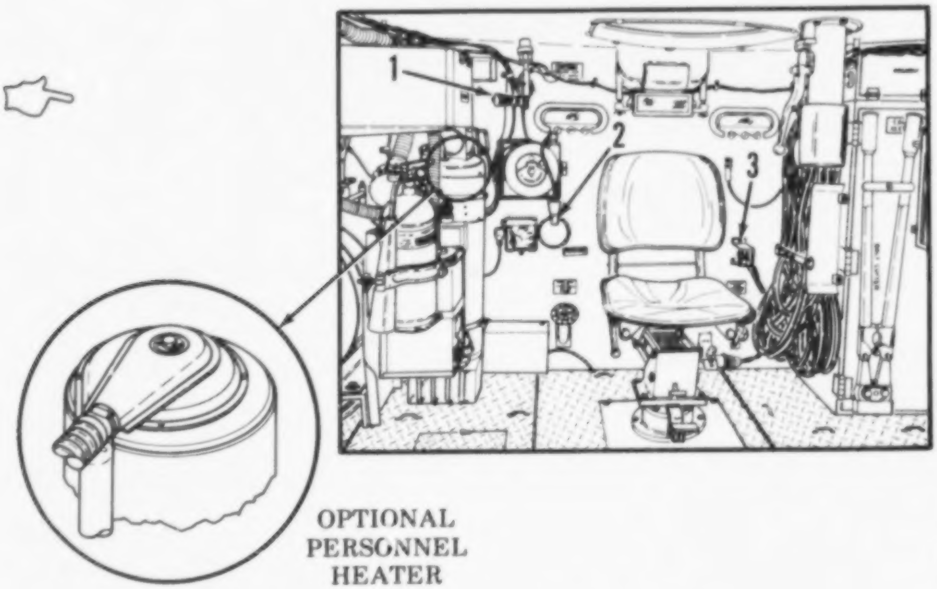
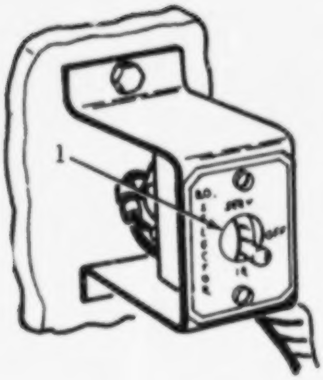


Figure 2-7. Rigger's controls (Sheet 1 of 2).

TA171581



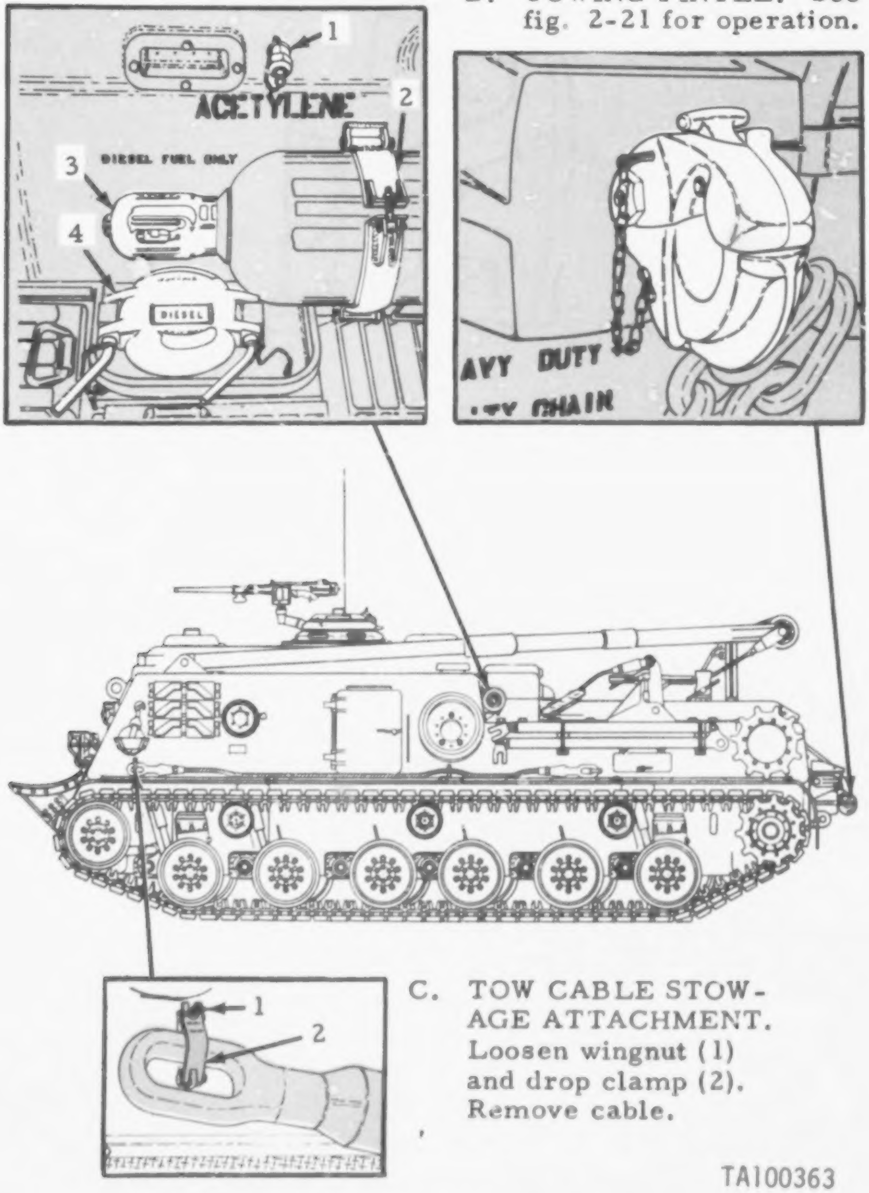
3. RIGGER'S LIGHT CONTROLS

To operate B.O. selector switch (1)

a. Turn MASTER switch ON
b. Vehicle light switch to STOPLIGHT
c. Activate SERVICE

TA100374

Figure 2-7. Rigger's controls (Sheet 2 of 2).


1
ACETYLENE
2
3
DIESEL FUEL ONLY
4
DIESEL
AVY DUTY
CHAIN
1
2

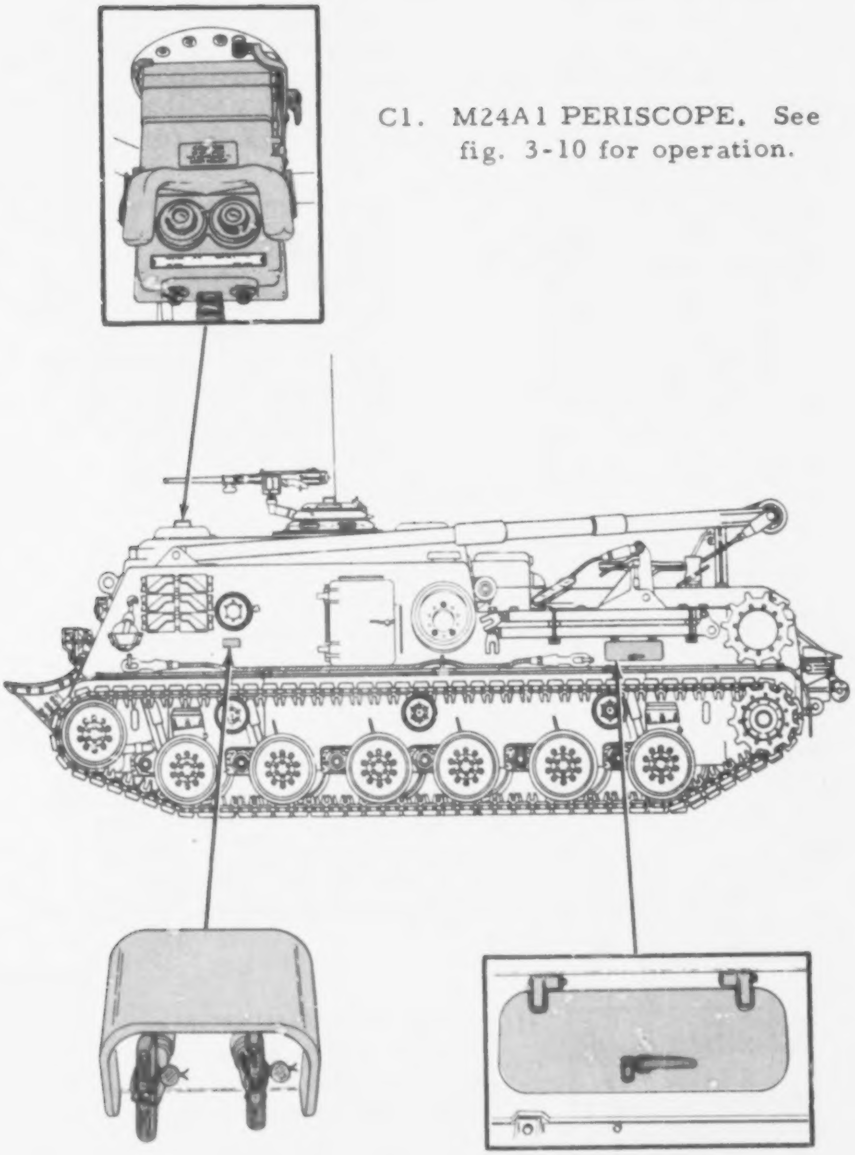
A. ACETYLENE PLUG (1), OXYGEN CYLINDER STRAP (2) AND VALVE COVER (3), FUEL TANK FILL COVER (4).

B. TOWING PINTLE. See fig. 2-21 for operation.

C. TOW CABLE STOWAGE ATTACHMENT. Loosen wingnut (1) and drop clamp (2). Remove cable.

TA100363

Figure 2-8. General vehicle controls (Sheet 1 of 18).



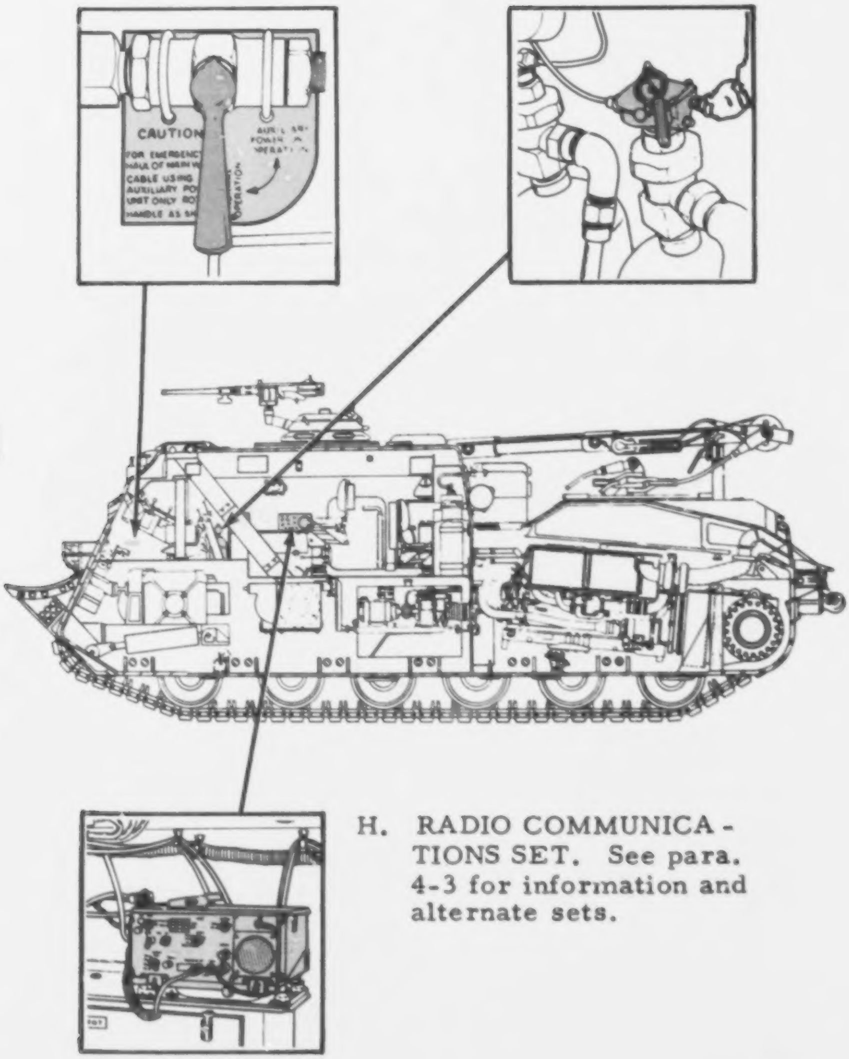
C1. M24A1 PERISCOPE. See fig. 3-10 for operation.

D. FIXED FIRE EXTINGUISHER OUTSIDE PULL HANDLES. See fig. 2-40 for operation.

E. LEFT SIDE STOWAGE COMPARTMENT DOOR.

TA100375

Figure 2-8. General vehicle controls (Sheet 2 of 18).



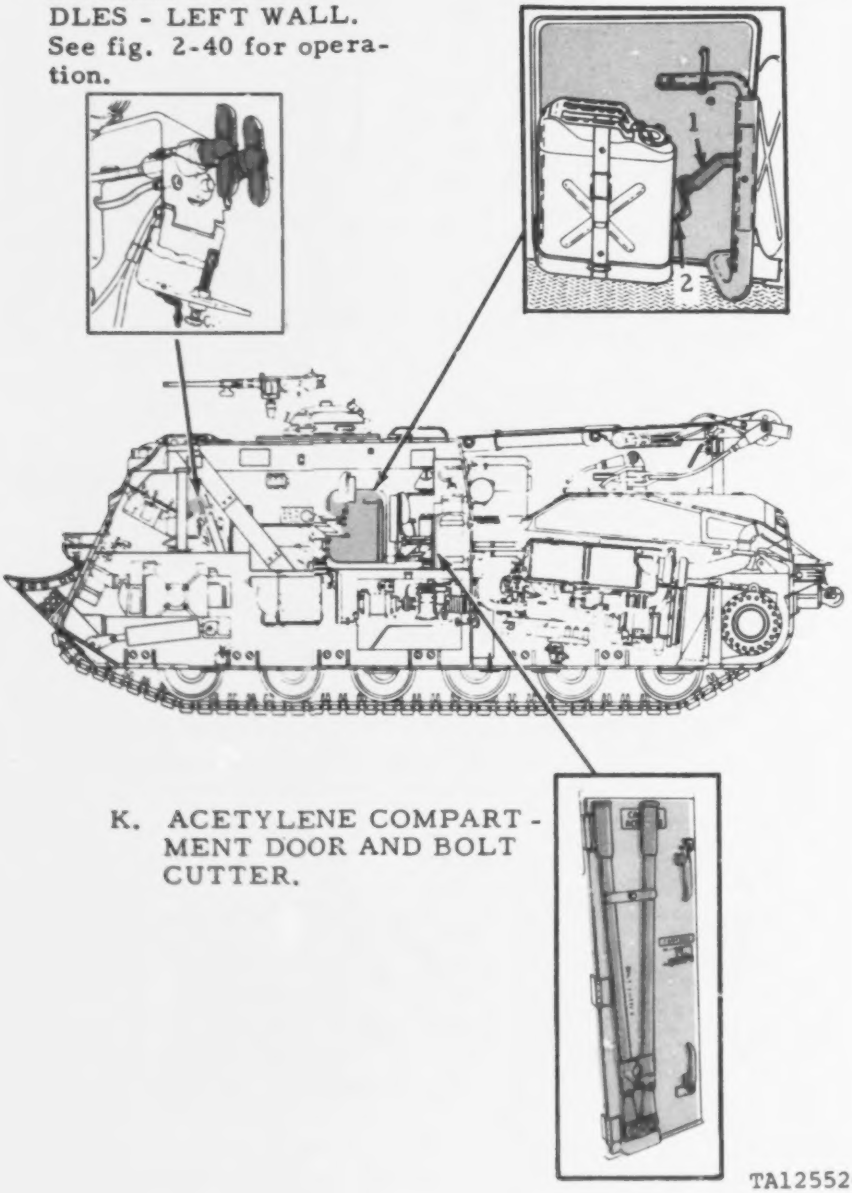
F. APU EMERGENCY WINCH CONTROL VALVE. See fig. 2-26 for operation.

G. FIXED FIRE EXTINGUISHER CYLINDER CONTROL LEVER (1 ON THE REAR CYLINDER OF EACH BANK). See fig. 2-40 for operations.

H. RADIO COMMUNICATIONS SET. See para. 4-3 for information and alternate sets.

TA100364

Figure 2-8. General vehicle controls (Sheet 3 of 18).

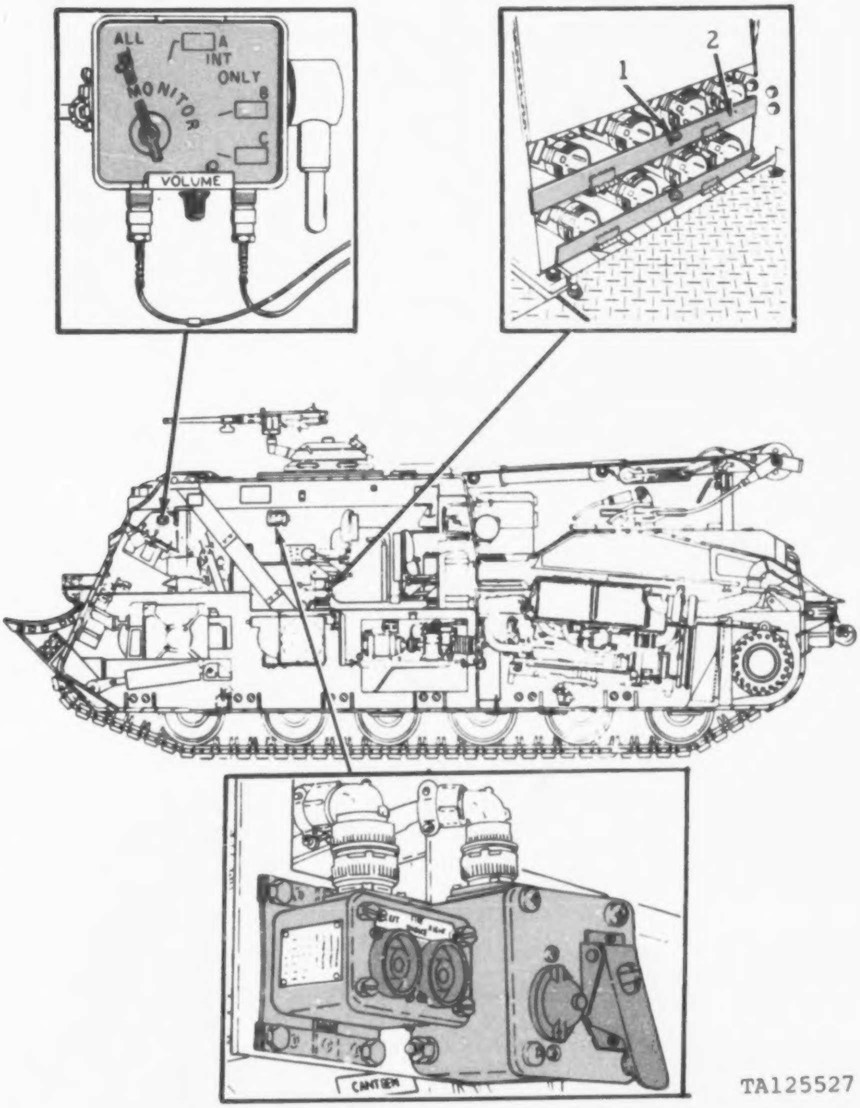


I. FIXED FIRE EXTINGUISHER PULL HANDLES - LEFT WALL. See fig. 2-40 for operation.

J. RIGHT PERSONNEL DOOR. Lift handle (1) to open. Insert pin (2) to lock.

K. ACETYLENE COMPARTMENT DOOR AND BOLT CUTTER.

Figure 2-8. General vehicle controls (Sheet 4 of 18).


ALL
A
INT
ONLY
MONITOR
B
C
VOLUME
1
2
CANTEEN
TA125527

L. INTERPHONE CONTROL BOX (4 IN CREW COMPARTMENT). See para. 4-1 for information.

M. LAW ROCKET STOWAGE TRAYS. Turn knob (1) and lower bracket (2).

N. 1 M239 SMOKE GRENADE ARMING AND FIRING SWITCHES. See fig. 4-8 for operation.

Figure 2-8. General vehicle controls (Sheet 5 of 18).

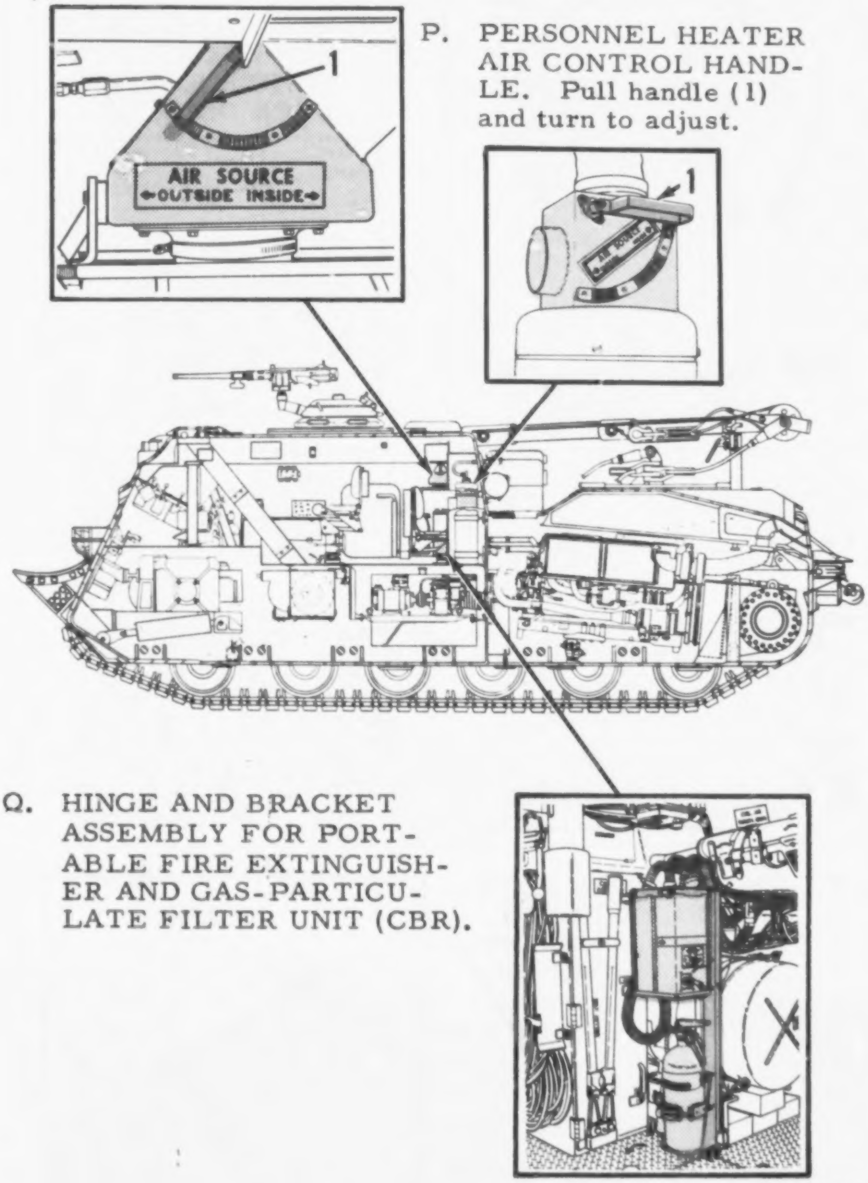
O. AIR CLEANER AIR CONTROL HANDLE. Pull handle (1) and turn to adjust (one above each air cleaner).

NOTE

Later optional heater design does not include an air control handle assembly.

P. PERSONNEL HEATER AIR CONTROL HANDLE. Pull handle (1) and turn to adjust.

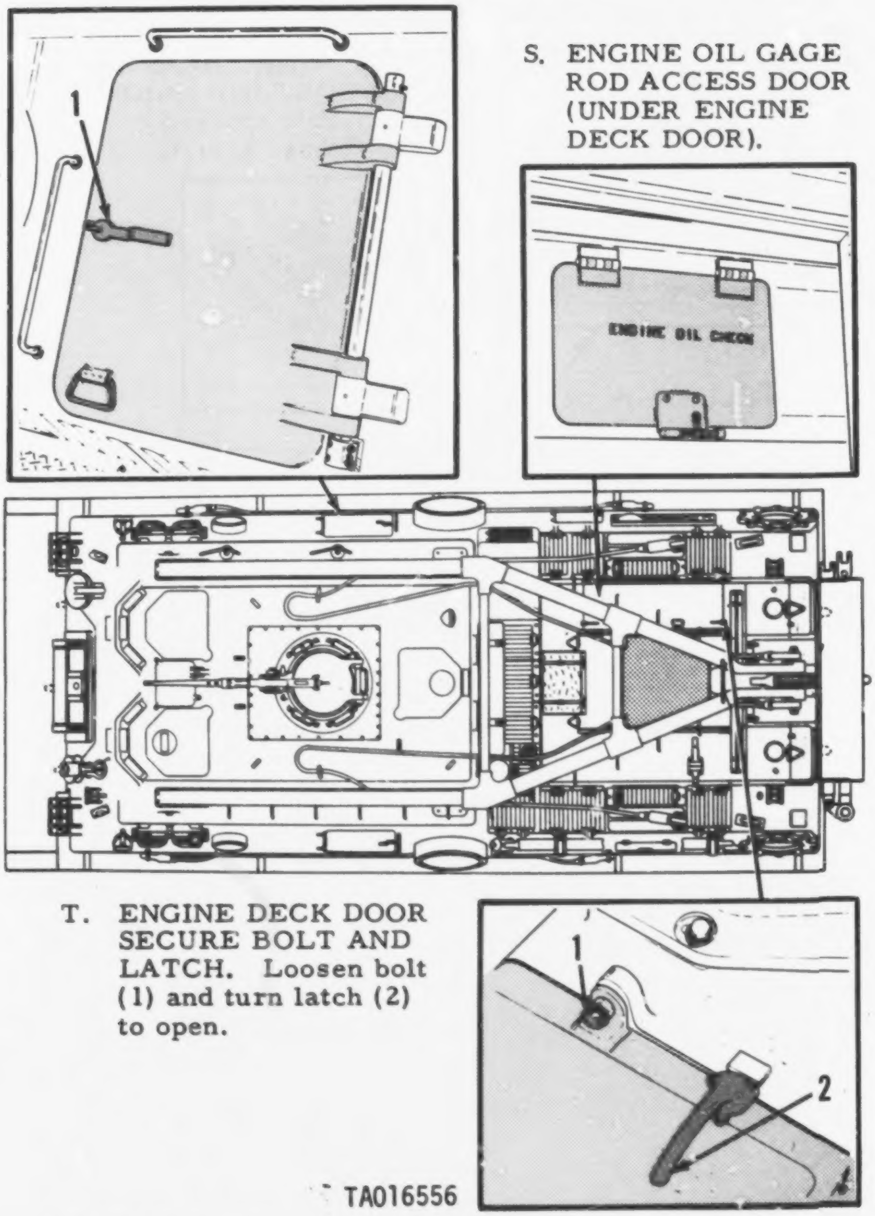
Q. HINGE AND BRACKET ASSEMBLY FOR PORTABLE FIRE EXTINGUISHER AND GAS-PARTICULATE FILTER UNIT (CBR).



TA171273

Figure 2-8. General vehicle controls (Sheet 6 of 18).

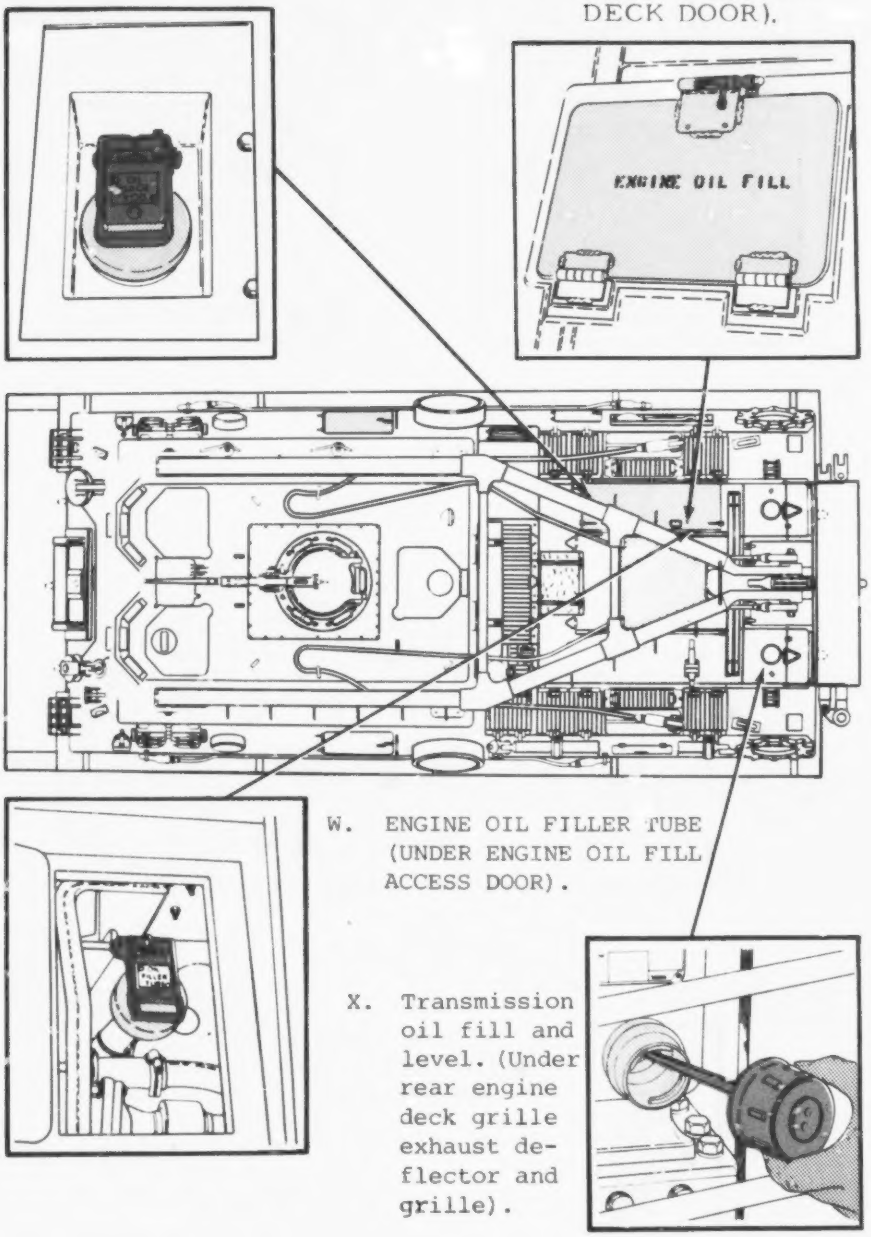
R. PERSONNEL DOOR RIGHT SIDE. Lift handle (1) to open.


1
ENGINE OIL CHECK
1
2
TA016556

S. ENGINE OIL GAGE ROD ACCESS DOOR (UNDER ENGINE DECK DOOR).

T. ENGINE DECK DOOR SECURE BOLT AND LATCH. Loosen bolt (1) and turn latch (2) to open.

Figure 2-8. General vehicle controls (Sheet 7 of 18).



U. ENGINE OIL GAGE ROD (UNDER GAGE ROD ENGINE OIL ACCESS DOOR).

V. ENGINE OIL FILL ACCESS DOOR (UNDER ENGINE DECK DOOR).

W. ENGINE OIL FILLER TUBE (UNDER ENGINE OIL FILL ACCESS DOOR).

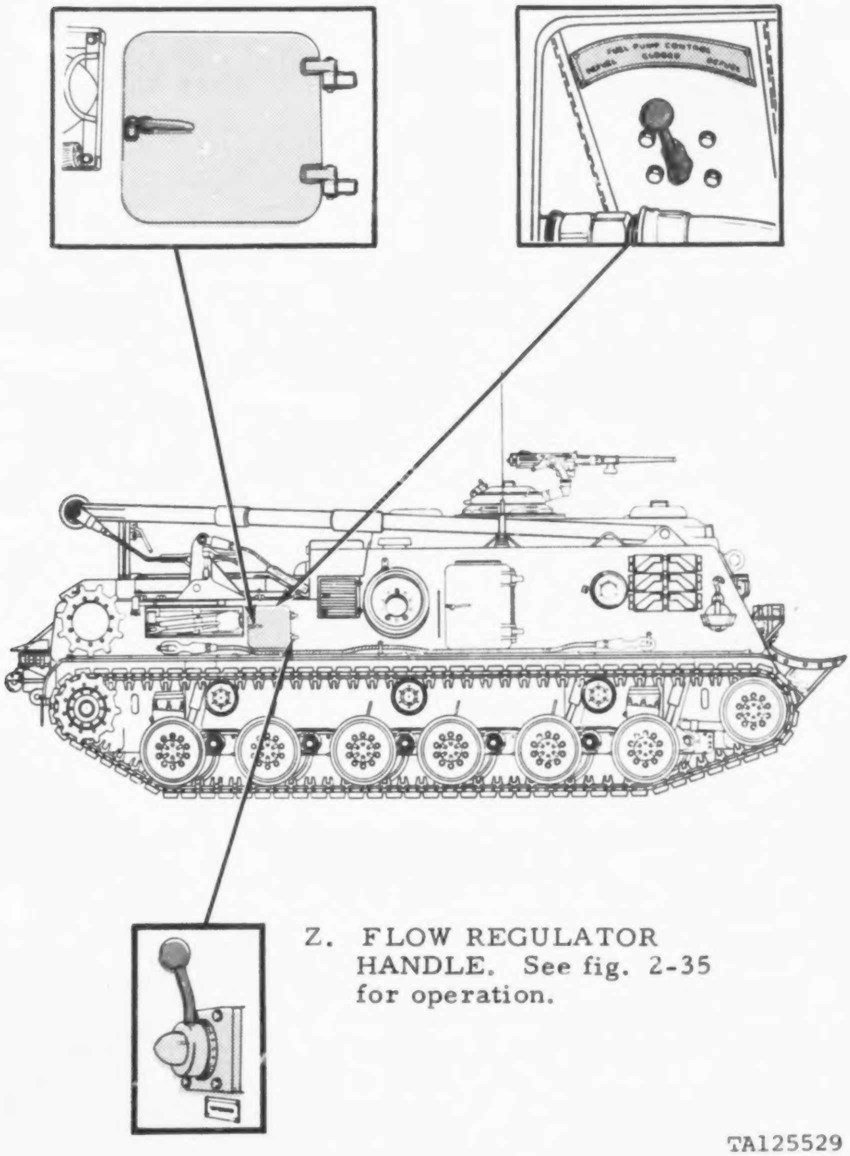
X. Transmission oil fill and level. (Under rear engine deck grille exhaust deflector and grille).

TA171226

Figure 2-8. General vehicle controls (Sheet 8 of 18).

X. RIGHT SIDE STOWAGE DOOR (CONTROL AND REGULATOR VALVES, IMPACT WRENCH, FUEL TRANSFER HOSE).

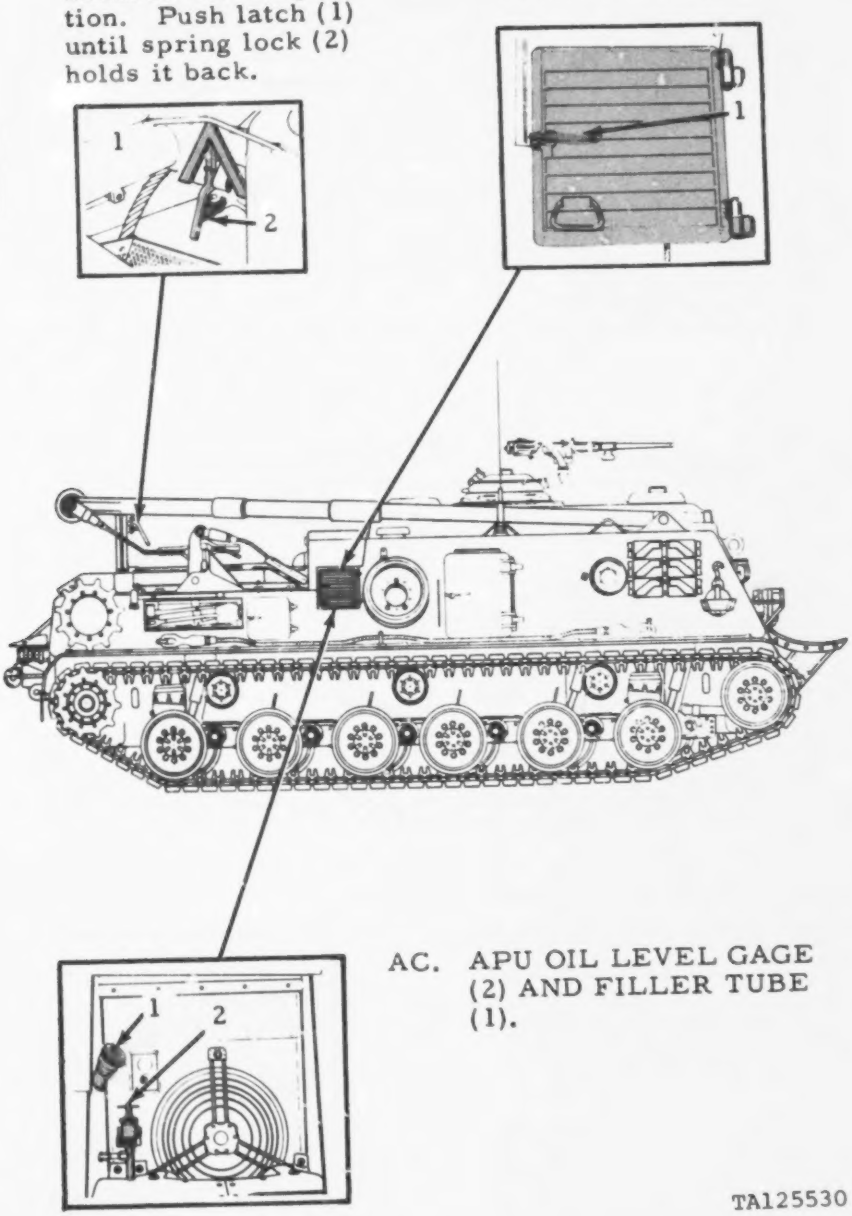
Y. FUEL PUMP CONTROL HANDLE. See fig. 2-35 for operation.



Z. FLOW REGULATOR HANDLE. See fig. 2-35 for operation.

TA125529

Figure 2-8. General-vehicle controls (Sheet 9 of 18).

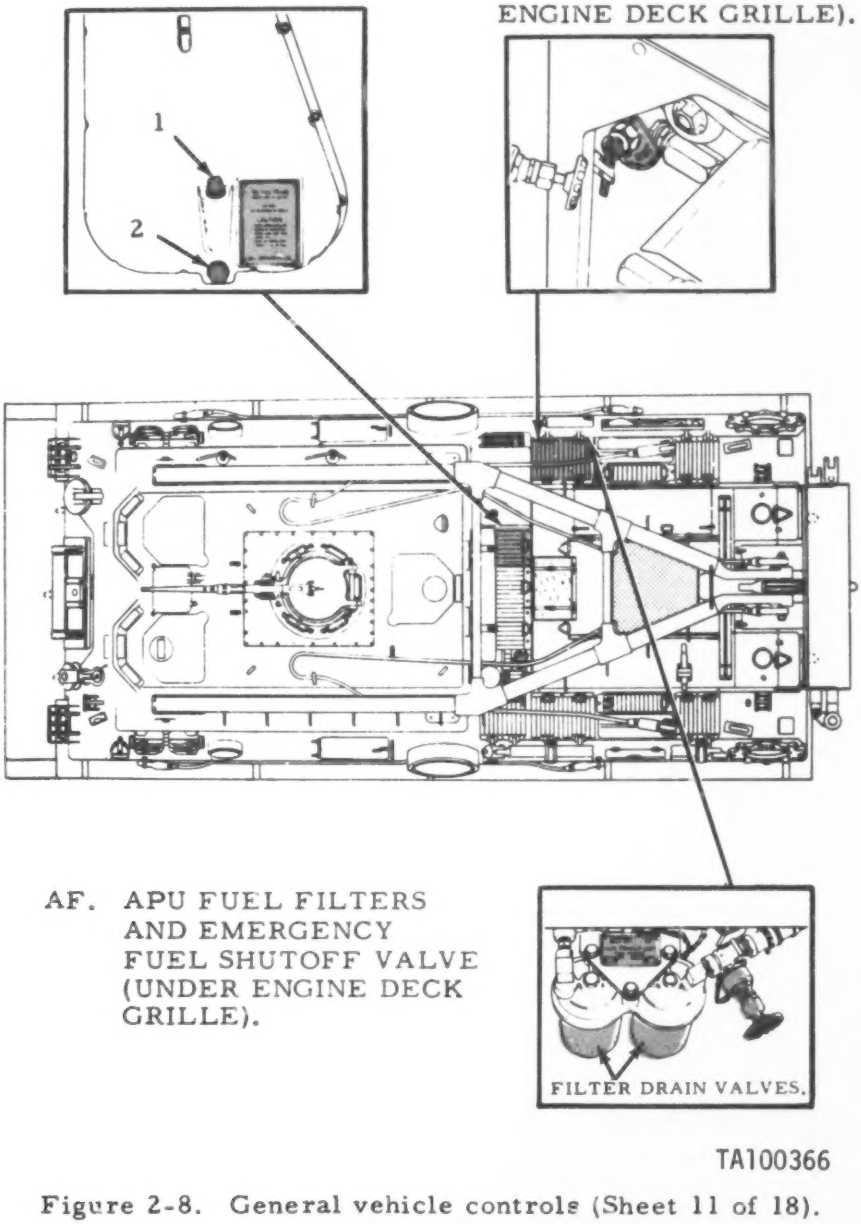


AA. BOOM LATCH. Locks boom in stowed position. Push latch (1) until spring lock (2) holds it back.

AB. AUXILIARY POWER UNIT (APU) COMPARTMENT DOOR. Lift handle (1) to open.

AC. APU OIL LEVEL GAGE (2) AND FILLER TUBE (1).

Figure 2-8. General vehicle controls (Sheet 10 of 18).

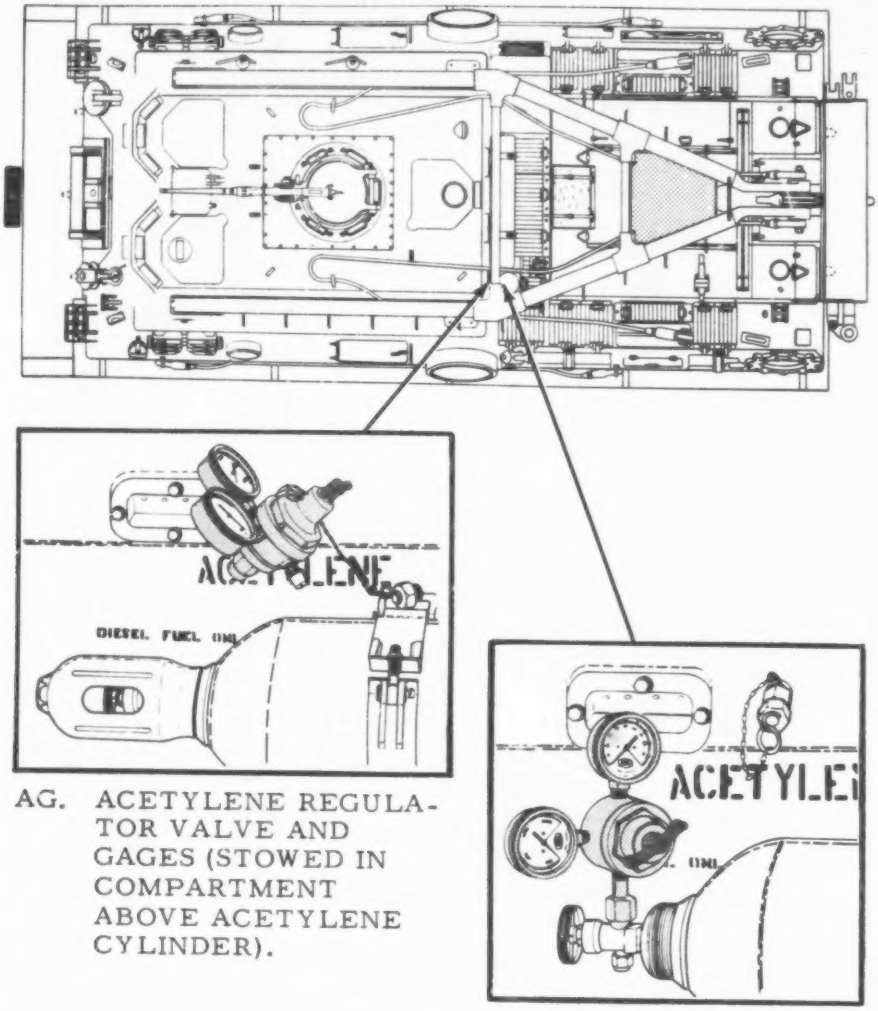


AD. APU CHAIN CASE OIL FILL (1) AND DRAIN PLUGS (2). To service remove front engine deck grille.

AE. APU CRANKCASE OIL DRAIN VALVE (UNDER ENGINE DECK GRILLE).

AF. APU FUEL FILTERS AND EMERGENCY FUEL SHUTOFF VALVE (UNDER ENGINE DECK GRILLE).

Figure 2-8. General vehicle controls (Sheet 11 of 18).

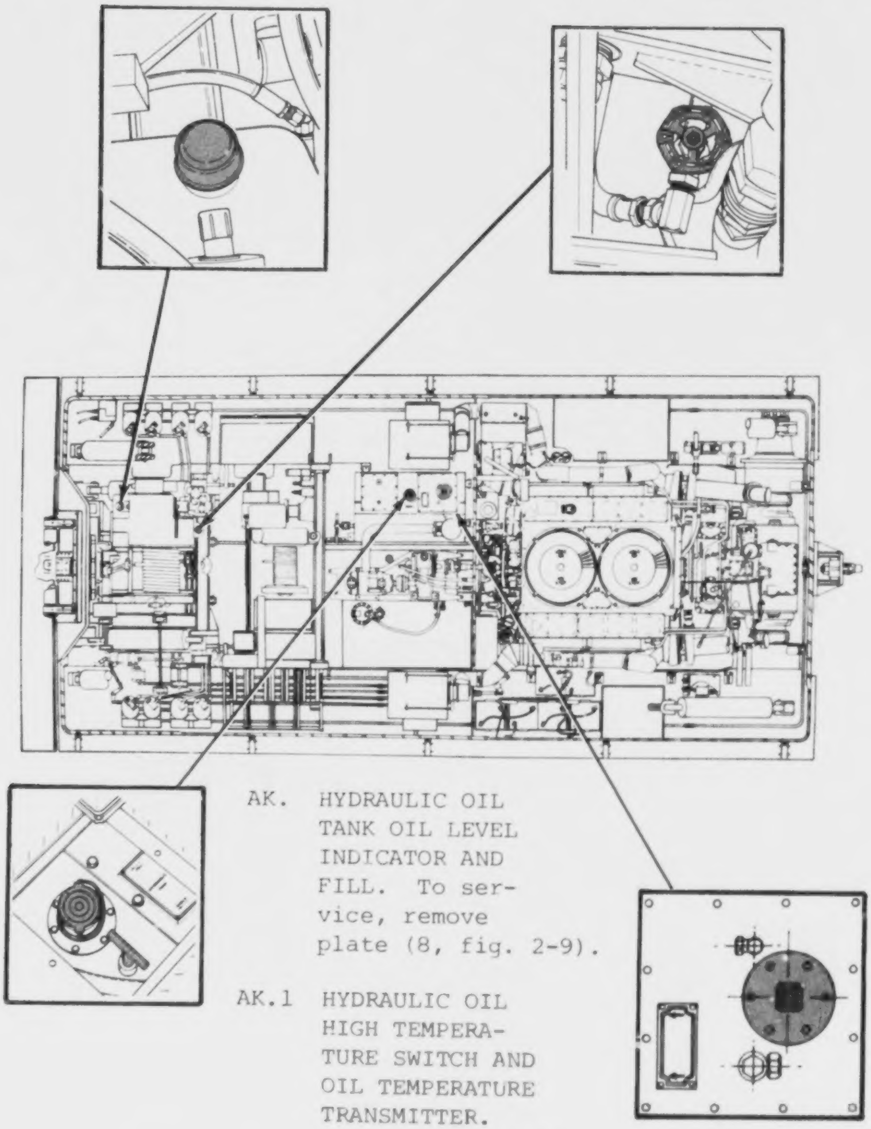

ACETYLENE
DIESEL FUEL ONL
ACETYLE

AG. ACETYLENE REGULATOR VALVE AND GAGES (STOWED IN COMPARTMENT ABOVE ACETYLENE CYLINDER).

AH. OXYGEN REGULATOR VALVE AND GAGES (STOWED IN COMPARTMENT ABOVE ACETYLENE CYLINDER.

TA100365

Figure 2-8. General vehicle controls (Sheet 12 of 18).



AI. MAIN WINCH OIL LEVEL INDICATOR. To service, remove plate (1, fig. 2-9).

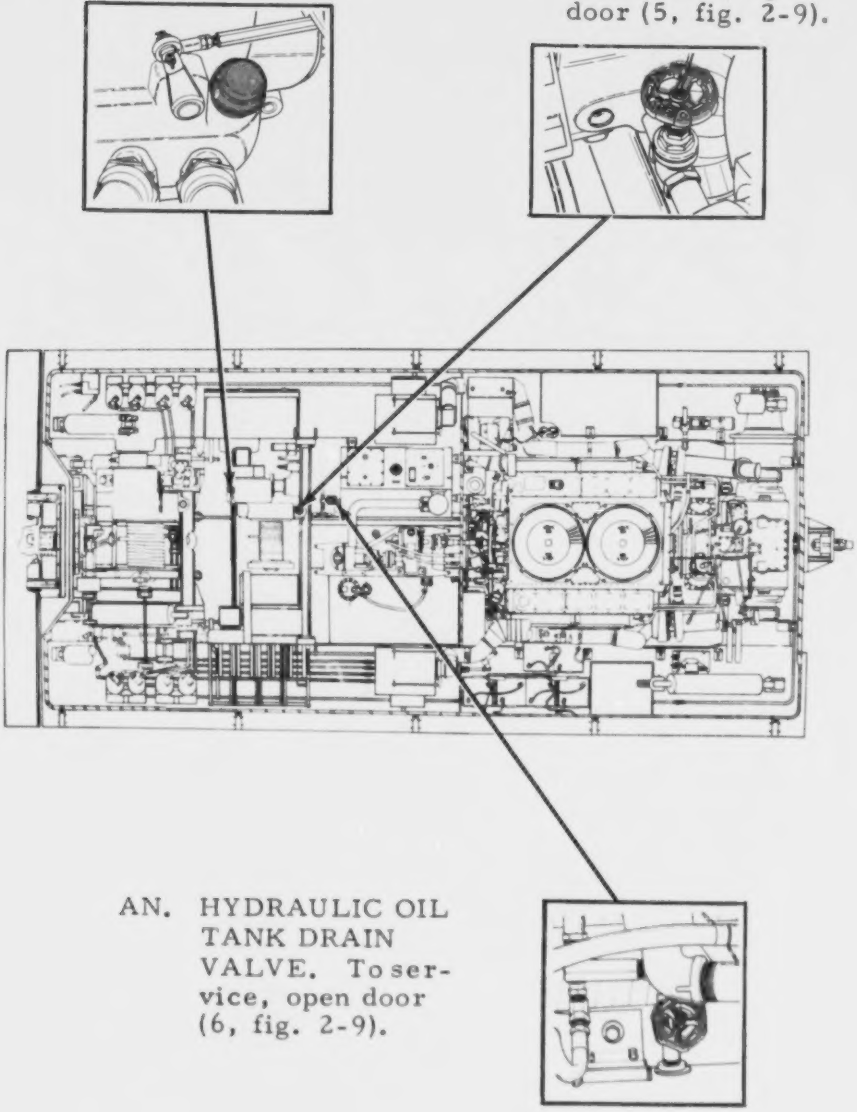
AJ. MAIN WINCH OIL DRAIN VALVE. To service, open door (3, fig. 2-9).

AK. HYDRAULIC OIL TANK OIL LEVEL INDICATOR AND FILL. To service, remove plate (8, fig. 2-9).

AK.1 HYDRAULIC OIL HIGH TEMPERATURE SWITCH AND OIL TEMPERATURE TRANSMITTER. To service, refer to TM 9-2350-256-20.

TA171227

Figure 2-8. General vehicle controls (Sheet 13 of 18).



AL. HOIST WINCH OIL LEVEL INDICATOR. To service, open door (3, fig. 2-9).

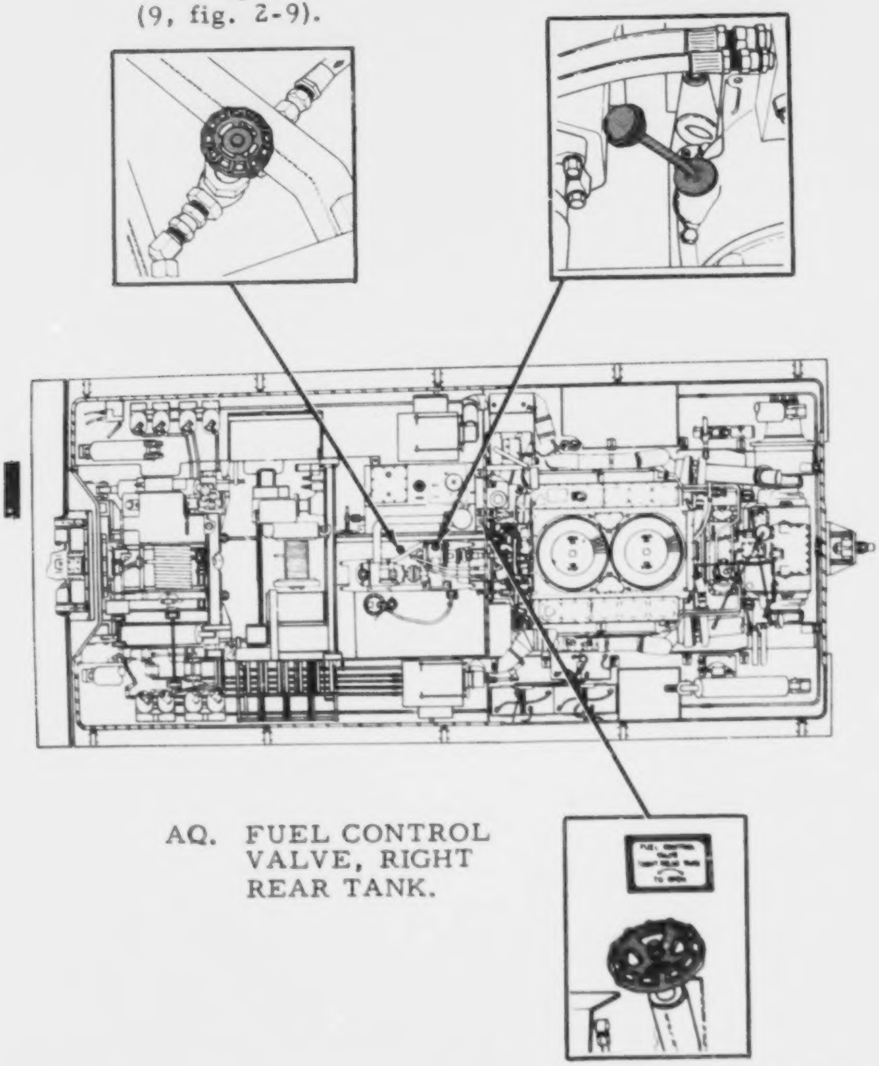
AM. HOIST WINCH OIL DRAIN VALVE. To service, open door (5, fig. 2-9).

AN. HYDRAULIC OIL TANK DRAIN VALVE. To service, open door (6, fig. 2-9).

TA171228

Figure 2-8. General vehicle controls (Sheet 14 of 18).

best copy available



AO. MECHANICAL TRANSMISSION OIL DRAIN VALVE. To service, open door (9, fig. 2-9).

AP. MECHANICAL TRANSMISSION OIL LEVEL INDICATOR AND FILL. To service, open door (9, fig. 2-9).

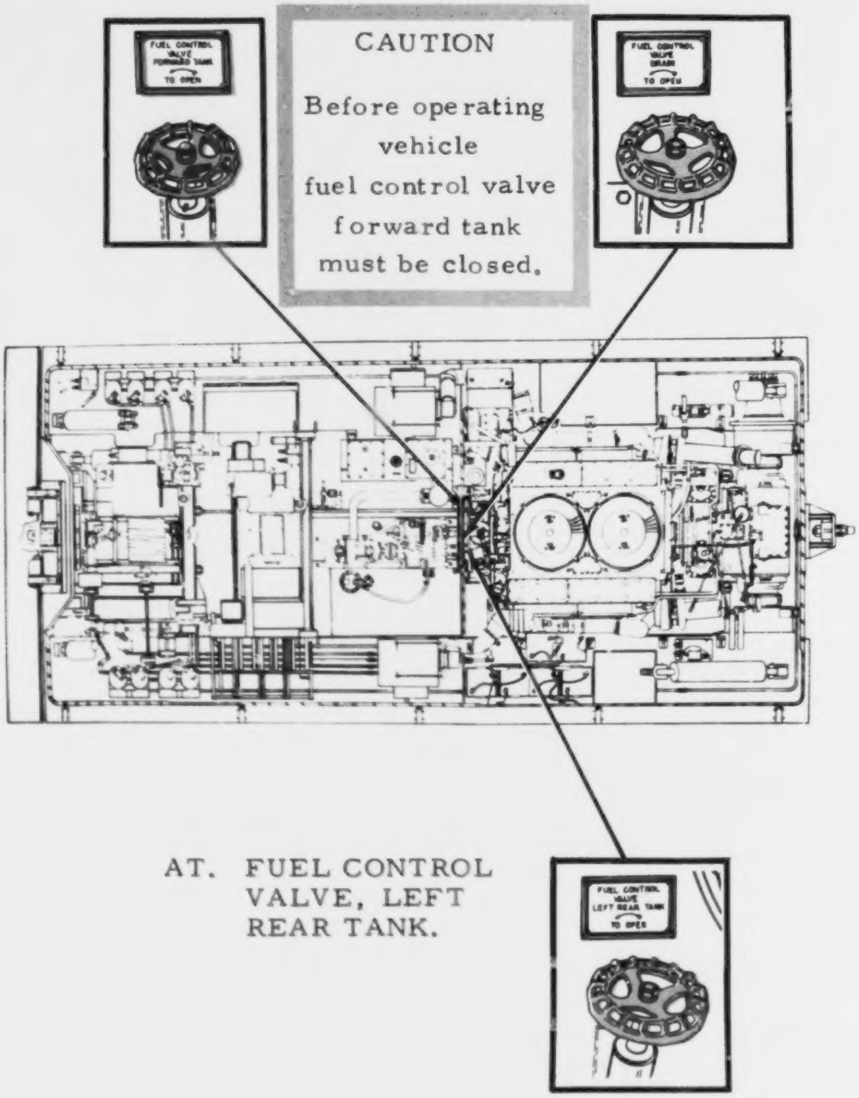
AQ. FUEL CONTROL VALVE, RIGHT REAR TANK.

TA171229

Figure 2-8. General vehicle controls (Sheet 15 of 18).

AR. FUEL CONTROL VALVE, FORWARD TANK.

AS. FUEL CONTROL VALVE, DRAIN.


FUEL CONTROL VALVE FORWARD TANK
TO OPEN
FUEL CONTROL VALVE DRAIN
TO OPEN
FUEL CONTROL VALVE LEFT REAR TANK
TO OPEN

CAUTION

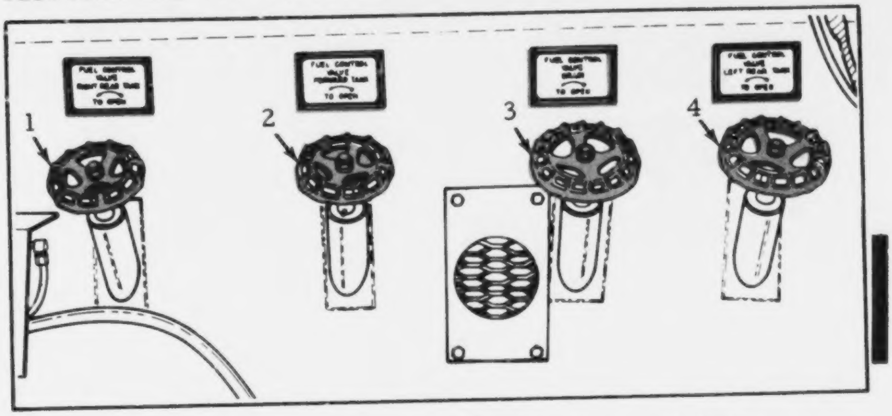
Before operating vehicle fuel control valve forward tank must be closed.

AT. FUEL CONTROL VALVE, LEFT REAR TANK.

TA171230

Figure 2-8. General vehicle controls (Sheet 16 of 18).

Four fuel control valves are located on the rear crew compartment wall. They are used to open or close the fuel tank and drain valves.



Operation	Fuel valve positions			
	Right tank (1)	Forward tank (2)	Drain (3)	Left tank (4)
Normal operation	Open	Closed	Closed	Open
Refuel - Defuel (Diesel fuel only)	Open	Closed	Closed	Open
APU operation	Open	Closed	Closed	Open

NOTE

If rear tanks are too low for APU operation, OPEN forward tank valve (2). CLOSE valve when you are finished.

Draining tanks				
Forward	Closed	Closed	Open	Closed
Forward and right	Open	Closed	Open	Closed
Forward and left	Closed	Closed	Open	Open

TA125532

Figure 2-8. General vehicle controls (Sheet 17 of 18).

NOTES

1. Forward tank drains whenever drain valve (3) is OPEN.
2. Right and left tank levels are the same when right and left tank valves (1 and 4) are open.
3. If the right or left tank leaks, CLOSE its valve (1 or 4) so more fuel isn't lost.
4. If the forward tank leaks, shut down the vehicle and CLOSE the right and left tank valves (1 and 4).

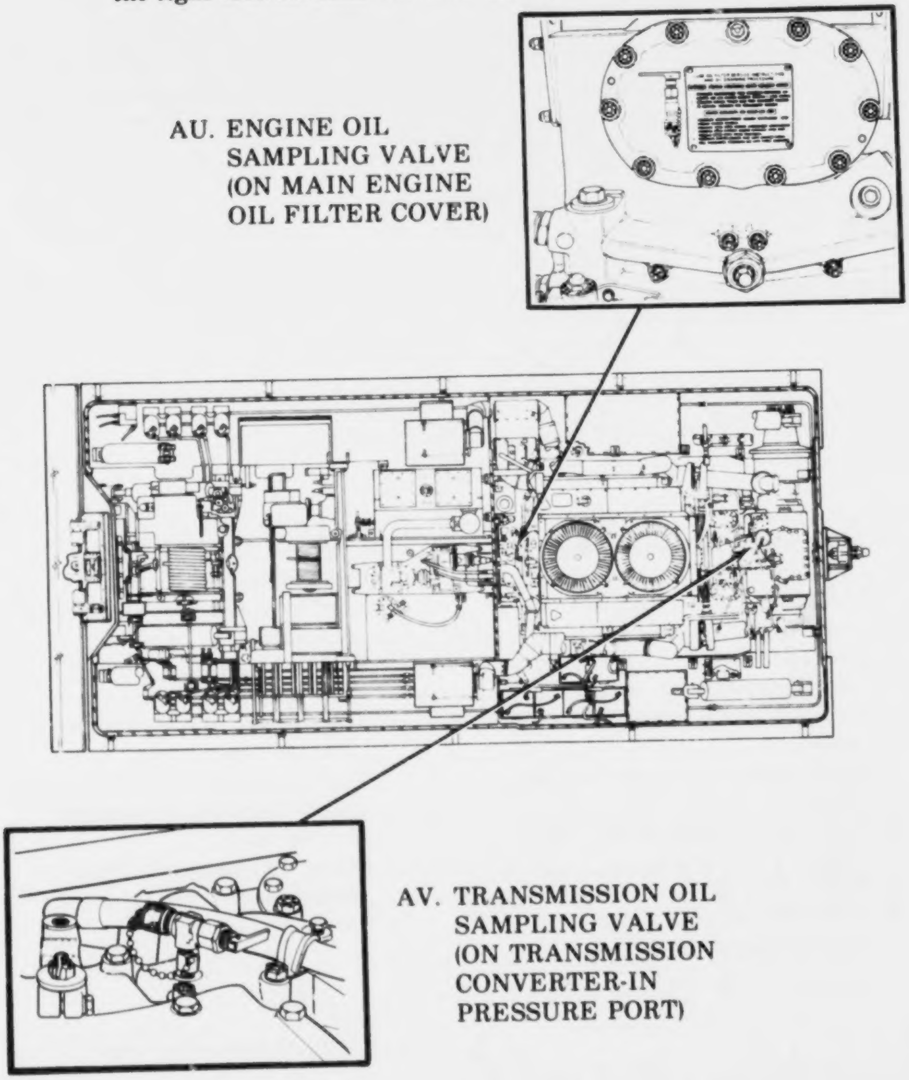
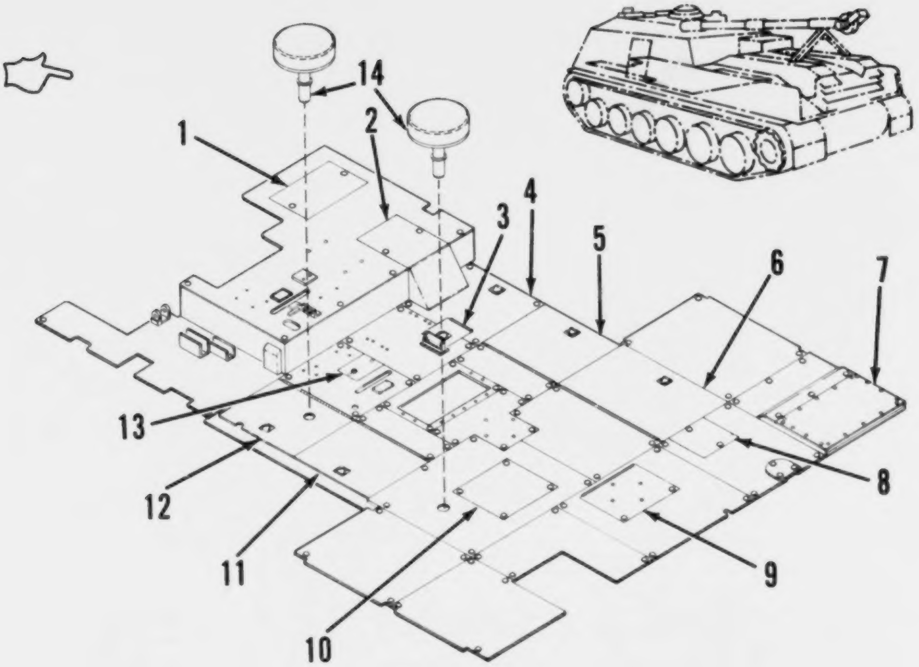

AU. ENGINE OIL SAMPLING VALVE (ON MAIN ENGINE OIL FILTER COVER)
AV. TRANSMISSION OIL SAMPLING VALVE (ON TRANSMISSION CONVERTER-IN PRESSURE PORT)

Figure 2-8. General vehicle controls (Sheet 18 of 18).

TA171274



1. Main winch fill and level access plate
2. Hydraulic hose connection access plate
3. Hoist winch fill and level, main winch drain valve access door
4. Hydraulic hose connection access plate
5. Hoist winch drain valve access door
6. Hydraulic oil tank drain access door
7. Hydraulic connections access door
8. Hydraulic oil tank fill and oil level indicator access plate
9. Hydraulic filter gage and mechanical transmission fill, level indicator and drain valve access door
10. Fuel level sending unit and fuel pump access door
11. Vehicle jack and utility chain storage access door
12. Track fixtures and track components bilge pump stowage, access door
13. Winch compartment light mount plate
14. Personnel seat (2)

Figure 2-9. Crew compartment floor access plates and doors.

TA171582

Section IV. OPERATION UNDER USUAL CONDITIONS

2-11. General.

a. This section contains instructions for operating the vehicle under normal weather conditions. Operations in unusual weather are covered in paras. 2-39 to 2-44.

b. Before you start the main engine and drive the vehicle, be sure to perform all the before-operation preventive-maintenance checks and services. These are found in chapter 3, table 3-1.

2-12. Starting the Main Engine.

a. Prestarting Instructions.

(1) Before you operate the vehicle, you must be familiar with the controls and instruments described in chapter 2, section III.

(2) If you find any warning tags in the operator's area, make sure the problems mentioned on them are corrected before you go any further.

(3) If the engine is new or reconditioned, be sure to perform the general and break-in services described in paragraphs 2-1 and 2-2.

(4) Make sure that all the controls on the M88A1 are properly positioned. Be certain that hatches and doors are secured and equipment is properly stowed. This will help insure effective operation and safe conditions for you and the crew. Never take anything for granted. Check everything yourself.

(5) Adjust your seats now so you won't have to when you're driving.

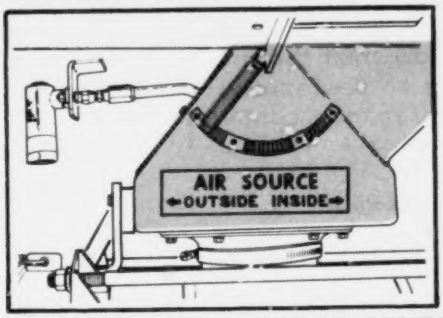
(6) Figure 2-10 shows the correct position of the operating controls before starting the vehicle.

b. Starting the Main Engine.

(1) See figure 2-11 for instructions on starting the main engine.

WARNING

If the crew compartment is closed up, make sure the air cleaner air control housing handles are set on OUTSIDE air source before starting the engine.



WARNING

Ear protection must be worn by personnel in the vehicle because of high vehicle noise.

(2) After you have started the engine, be sure it is operating properly. Check it out by following the engine check procedures in figure 2-12.

NOTE

When the MASTER switch is on the warning lights will be on until the engine is started and oil pressure builds up.

c. Starting the Main Engine Using the Auxiliary Power Receptacle (Slave Start). If the main engine does not start due to low or discharged batteries, it can be started with the help of another vehicle. Before slave starting, check battery electrolyte and cables. See figure 2-13 for slave starting procedures.

d. Starting the Main Engine by Towing.

(1) Under normal conditions and on level terrain, the engine may be started by towing the vehicle. See figure 2-14.

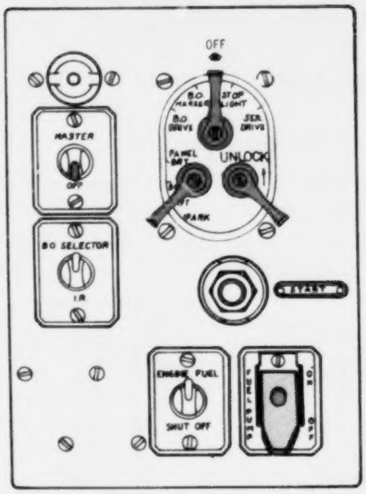
TA125533

Check the controls before starting the vehicle. Be sure all the following have been done:

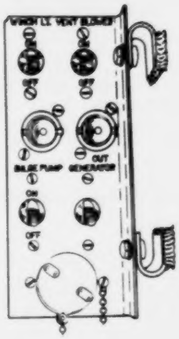
CAUTION

Before operating vehicle fuel control valve forward tank must be closed.

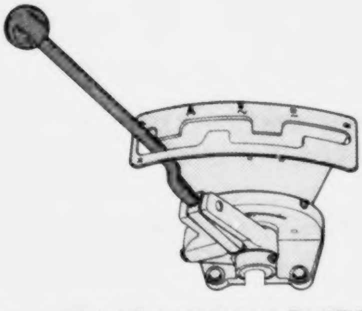
MASTER SWITCH, VEHICLE LIGHT SWITCH - OFF. FUEL PUMP SWITCH - Generally left ON. A cover is over switch to be sure of this. Turn switch OFF if MASTER switch is ON and you are not going to run the main engine.


OFF
B.O. MARKER
STOP LIGHT
B.O. DRIVE
SER. DRIVE
PANEL BRT
UNLOCK
PARK
MASTER
OFF
B.O SELECTOR
I.R.
START
ENGINE FUEL
SHUT OFF
FUEL PUMP
ON
OFF

1. SWITCH PANEL.


WINCH LT.
VENT BLOWER
OFF
OFF
BILGE PUMP
OUT GENERATOR
ON
OFF

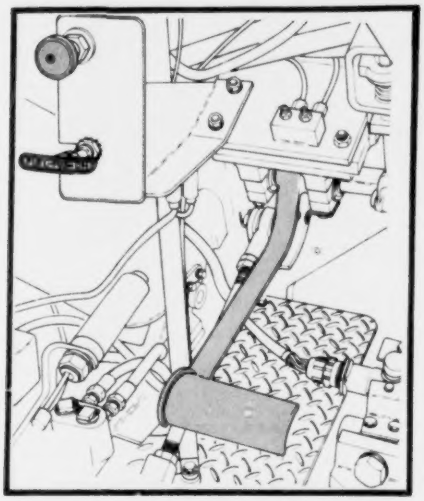
2. ACCESSORIES PANEL- ALL SWITCHES OFF. (GENERATOR switch - down).



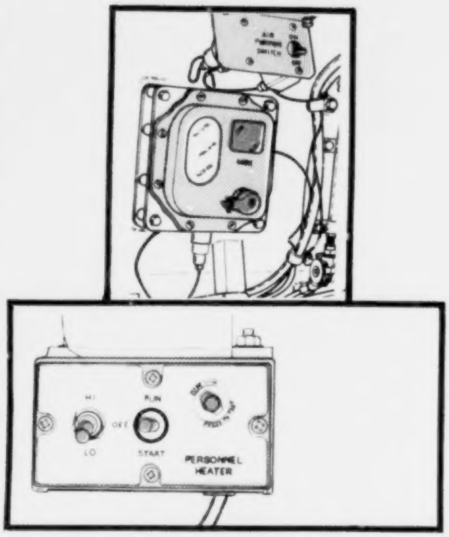
3. TRANSMISSION SHIFT SELECTOR - PARK (P). Be sure steering wheel is centered and locked.

TA171231

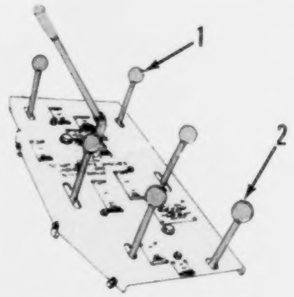
Figure 2-10. Prestarting instructions (Sheet 1 of 3).



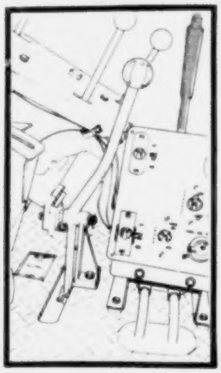
4. BRAKE-DEPRESS AND LOCK (TRANSMISSION MUST BE IN PARK (P)). THROTTLE-IN. FUEL SHUTOFF HANDLE-IN.



5. DOME LIGHTS, PERSONNEL HEATER AND AIR PURIFIER SWITCHES-OFF.



6. HYDRAULIC CONTROLS; lever (1)-MAIN, (2)-OFF, all others automatically neutral or OFF. MAIN WINCH and HOIST WINCH shift levers-NEUTRAL.



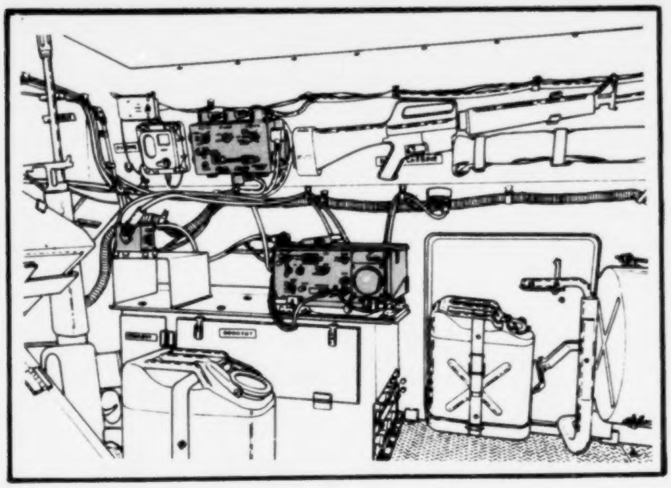
7. DRAIN VALVE LEVER-CLOSED.

TA171232

CAUTION

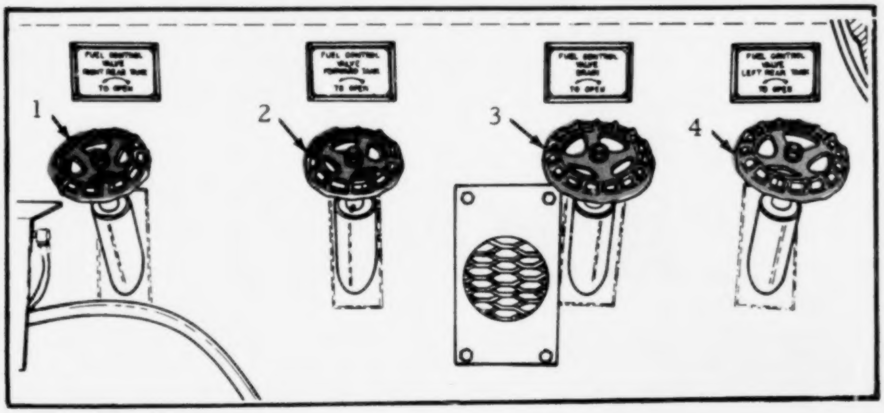
Always check to be certain power control lever (2) is in the OFF position during normal vehicle driving operations to prevent throttle linkage solenoid link failure.

Figure 2-10. Prestarting instructions (Sheet 2 of 3).



8. RADIO COMMUNICATIONS EQUIPMENT-OFF.

9. Check all inside and outside fire extinguisher controls for unbroken seals.



10. FUEL CONTROL VALVES-SET.

When operating the vehicle under normal conditions, set the fuel control valves as follows;

1. Right tank - OPEN
2. Forward tank - CLOSED
3. Drain - CLOSED
4. Left tank - OPEN

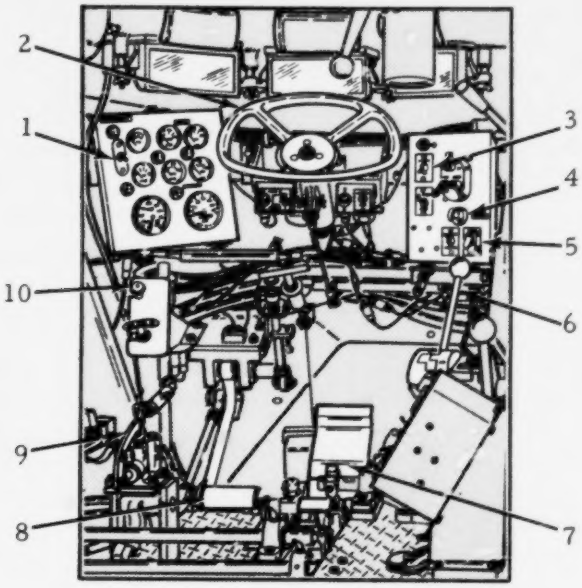
TA125536

Figure 2-10. Prestarting instructions (Sheet 3 of 3).

CAUTION

Turn off radio and electrical switches before starting the engine.

1. Shift transmission (6) to P. Depress brake (8) to lock it in position. Make sure steering wheel (2) is centered and locked.



2. Turn MASTER switch (3) ON. Check FUEL PUMP switch (5) for ON.

NOTE

When MASTER switch is ON, the master and mechanical transmission warning lights will stay on until engine is running. If lights do not come on, troubleshoot (table 3-2).

3. Move fuel selector switch (1) up and down to check fuel levels.

TA038802

Figure 2-11. Starting the main engine- normal weather (Sheet 1 of 3).

4. Operate purge pump (9) until back pressure is felt. 3 or 4 strokes should do it. This will help get the air out of the lines. Do not press preheat button.

5. Depress the accelerator pedal (7) 2/3 to 3/4 down. Push and hold START button (4) until engine runs. Release button and accelerator pedal.

CAUTION

If master warning light does not go out in 20 seconds after engine starts, stop the engine and notify organizational maintenance.

CAUTION

Do not hold the START button in for longer than 15 seconds. If engine cranks but fails to start, turn off the master switch and wait 3 to 5 minutes. Repeat starting procedures. If it doesn't start after the third try, troubleshoot (table 3-2).

6. If the battery charge is too low to start the engine, start the APU (fig. 2-34) and charge batteries for 20 minutes or slave start the vehicle (fig. 2-13).

7. Adjust hand throttle (10) for 1,000 to 1,200 rpm and let the engine warm up for 3 minutes. Turn throttle for fine adjustments. Depress button on throttle and push or pull for coarse adjustments. After 3 minutes return engine to low idle of 675 to 725 rpm.

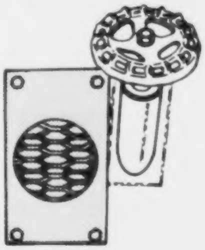
CAUTION

Be sure generator blower is operating when engine is running.

TA038803

Figure 2-11. Starting the main engine - normal weather (Sheet 2 of 3).

8. Hold a piece of paper up to the generator air intake. If paper is drawn to grille, OK. If it isn't, stop the engine (fig. 2-19) and call organizational maintenance.



9. Check engine for normal operation (fig. 2-12).

WARNING

Do not leave the operator's seat while engine is running.

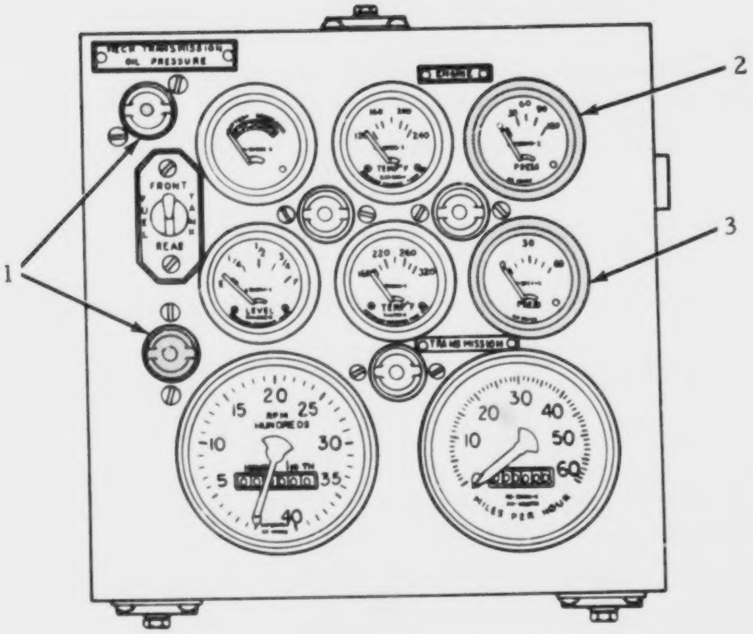
NOTE

During long standstill periods with engine running, hold engine speed at 1,000-1,200 rpm to keep it running smoothly.

10. For cold weather start see fig. 2-44.

TA038804

Figure 2-11. Starting the main engine - normal weather (Sheet 3 of 3).


OIL PRESSURE
ENGINE
FRONT
REAR
TEMP
PRESS
LEVEL
TRANSMISSION
RPM HUNDREDS
5
10
15
20
25
30
35
40
10
20
30
40
50
60
MILES PER HOUR
1
2
3

GAGE PANEL

1. Warning lights (1) should go out after the engine has run for 20 seconds.

2. Engine oil pressure (2) should be:
   15 psi at low idle (675-725 rpm).
   40-70 psi at 2,400 rpm.

3. Transmission oil pressure (3) should be:
   5 psi at low idle.
   15 to 19 psi at 2,400 rpm.

CAUTION

If warning lights come on while operating the vehicle, stop the engine and call organizational maintenance.

4. There should be no unusual noises from the engine.

TA038805

Figure 2-12. Checking engine operation.

NOTE

The M88A1 is equipped with a NATO slave receptacle and requires an adapter for slave starting.

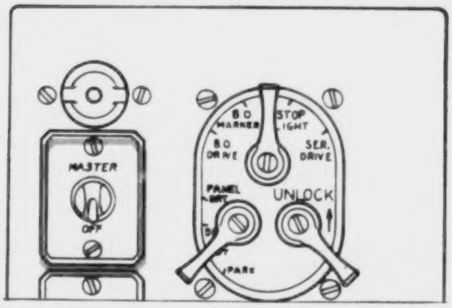
CAUTION

Turn off radio and electrical switches before starting the engine.

NOTE

These instructions are for starting your vehicle as well as for you to start another dead vehicle.

1. Turn the MASTER switch OFF in the dead vehicle. (Dead vehicle - vehicle with low batteries. Live vehicle - vehicle doing the slaving).



WARNING

Do not allow personnel to get between the two vehicles. Lock brakes on vehicles and reduce engine to low idle.

2. Position a vehicle with 6 batteries having a 24 volt system near the dead vehicle so the auxiliary power (slave) receptacles are close together.

NOTE

If the live vehicle is an M60 series, M88A1, M728 or M48A3 and M48A5 keep the engine running.

TA038806

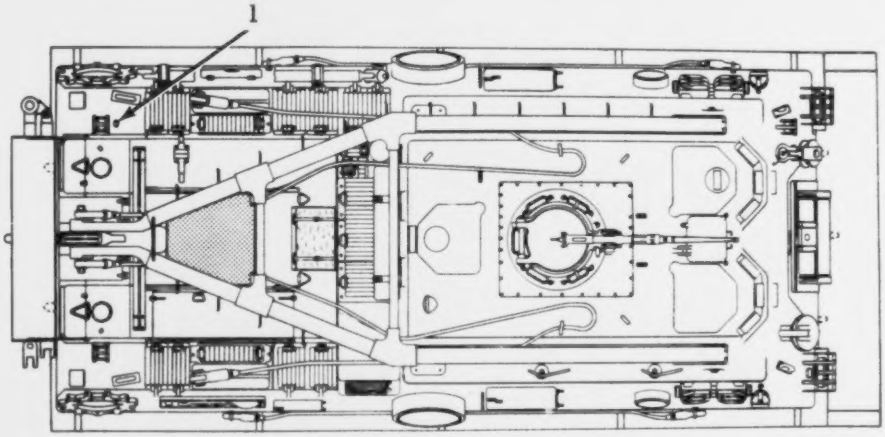
Figure 2-13. Slave starting the main engine (Sheet 1 of 3).

3. Turn MASTER switch OFF on both vehicles.

NOTE

Live M60 series, M88A1, M728, M48A3 and M48A5 vehicle engines will keep running with MASTER switch OFF.

4. Connect slave cables to slave receptacle (1) of both vehicles.



5. Live vehicle must have MASTER switch ON for charging if time and situation permits. Charge the dead vehicle's batteries for 15 minutes before trying to start engine.

6. Turn MASTER switch ON in dead vehicle after charging period. If an M60, M60A1, M728, M88A1, or M48A3 vehicle is used, turn master switch OFF in live vehicle with engine running to prevent damaging the generator and electrical systems.

7. Start engine of dead vehicle (fig. 2-11).

CAUTION

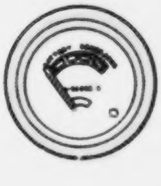
If dead vehicle does not start within 15 seconds, release the START button and accelerator pedal. Turn off the MASTER switch and wait 3 to 5 minutes. Repeat starting procedures. If it doesn't start on third try, troubleshoot (table 3-2).

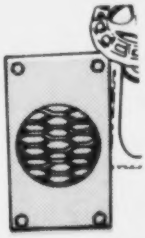
Figure 2-13. Slave starting the main engine (Sheet 2 of 3).

TA125537

8. Disconnect slave cable from both vehicles.

9. Check BATTERY-GENERATOR indicator and generator blower operation. If generator blower does not operate, stop engine (fig. 2-19) and notify organizational maintenance.





10. If vehicle isn't going to be driven for a long period, idle the engine at 1,000 to 1,200 rpm for 30 minutes to recharge the batteries.

TA038808

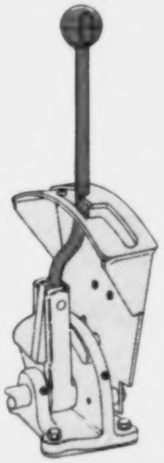
Figure 2-13. Slave starting the main engine (Sheet 3 of 3).

1. Prepare the vehicle for towing with tow bar. See figure 2-21.

NOTE

Station an observer in clear view of both operators to direct the towing operation.

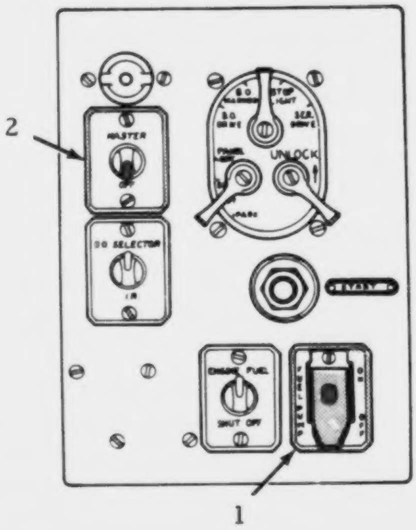
2. Shift transmission in dead vehicle to 2nd gear.



TRANSMISSION SHIFT

3. Check FUEL PUMP switch (1) for ON.

4. Turn MASTER switch (2) ON.



SWITCH PANEL

NOTE

If master warning light doesn't light at this time, troubleshoot (table 3-2).

5. Depress accelerator pedal about 1/2 inch.

6. Start towing in a straight line or a wide sweeping turn at about 8 mph.

TA171233

Figure 2-14. Starting the main engine by towing (Sheet 1 of 2).

CAUTION

If master warning light doesn't go out in about 20 seconds after engine start, stop the engine (fig. 2-19) and notify organizational maintenance.

7. If engine fails to start in about 3 to 5 minutes, signal observer, stop towing and troubleshoot (table 3-2).

8. Stop vehicle before shifting.

9. When engine starts, signal observer, stop vehicle, and disconnect and stow tow bar. Check generator blower. If it does not operate, stop the engine (fig. 2-19) and notify organizational maintenance.

Figure 2-14. Starting the main engine by towing (Sheet 2 of 2).

(2) Tow start the vehicle if you can't slave start or if starter trouble exists and the vehicle must be operated.

2-13. Driving the M88A1.

See figure 2-15. Figure 2-16 shows what transmission ranges to use while driving and figure 2-17 shows how steering affects vehicle direction.

2-14. Stopping the Vehicle.

See figure 2-18.

2-15. Driving Precautions.

a. General. Be careful. Know the vehicle and how it handles. Don't allow the vehicle to get out of control.

b. Hard Pavement. Care must be taken when driving on hard surfaces. Careless driving can result in loss of control causing serious damage and injury.

c. Crossing a Ditch, Shell Hole or Trench.

WARNING

Adjust vehicle speed and squarely approach an obstruction or obstacle. Warn crew members to brace themselves. Secure hatches and doors.

(1) When you approach a ditch, shell hole or trench slow down by releasing the accelerator. Use the brake if you have to.

(2) Put transmission selector into low (1st) gear.

(3) As soon as the vehicle reaches the bottom and starts to climb, depress the accelerator for power needed to climb out of the ditch.

d. Going Over an Obstacle.

TA038811

WARNING

Approach obstacle squarely. Warn crew to brace themselves. Secure hatches and doors.

WARNING

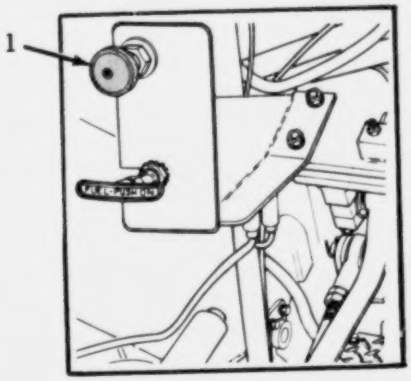
Secure covers, hatches and doors before moving vehicle to avoid injuring personnel.

CAUTION

Before moving out:

1. Be sure boom and spade are properly secured.
2. Check the area around the vehicle to avoid injuring personnel or damaging nearby equipment.

1. Push hand throttle (1) all the way in so engine is at low idle (675-725 rpm).



2. Hold brake down and shift to desired gear.

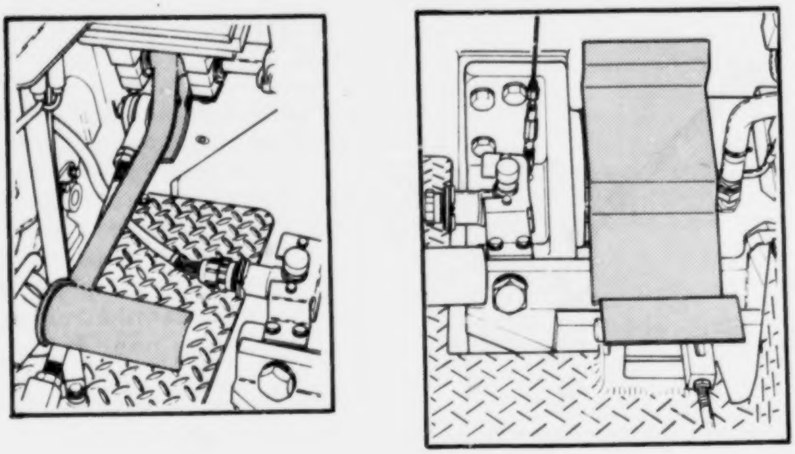
3. Release brake and accelerate to desired speed.

CAUTION

Don't use hand throttle in place of accelerator for speed control except in an emergency.

TA038812

Figure 2-15. Putting the vehicle in motion (Sheet 1 of 2).

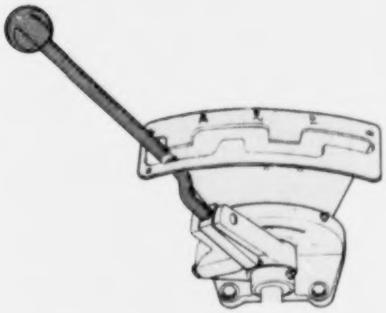


CAUTION

If you throw a track while driving, do not use the brake. Let off of the accelerator and coast to a stop.

TA038813

Figure 2-15. Putting the vehicle in motion (Sheet 2 of 2).



PARK (P)

Use when:

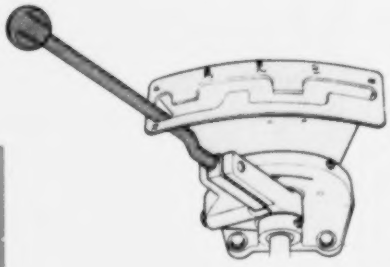
1. Starting engine.
2. Locking brakes (Pedal must be depressed).
3. Vehicle is parked.
4. Using boom and winches when vehicle is stationary.
5. At halt for long periods or if personnel or equipment are near by.

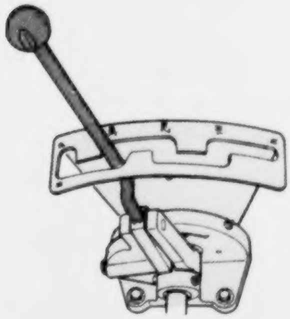
NEUTRAL (N)

Use when:

1. Vehicle is at halt for short period.
2. Making pivot turns.
3. Vehicle is being towed.

> **CAUTION**
>
> Vehicle must be completely stopped before shifting to NEUTRAL.





3rd

Use when:

Driving under normal conditions on hard surfaced road. Top speed is 26 mph.

> **CAUTION**
>
> Do not downshift from 3rd to 2nd above 12 mph.

TA171234

Figure 2-16. Transmission shift selection (Sheet 1 of 2).

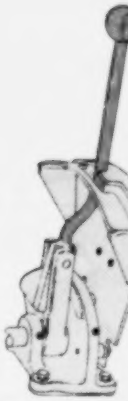
2nd

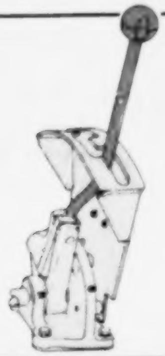
Use when:

1. Operating under heavy load.
2. Going up or down low slopes.
3. Starting vehicle in motion (normally).
4. Starting vehicle by towing.
5. Vehicle operation in deep or loose sand.

CAUTION

Do not downshift from 2nd to 1st above 5 mph.





1st

Use when:

1. Going up or down steep slopes.
2. Soft, muddy or very rough ground.
3. Crossing a ditch, shell hole or obstacle.

NOTE

Shift from 1st to 2nd gear when going over 5 mph.

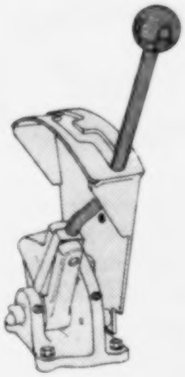
REVERSE

Use when:

1. Backing up.
2. In an emergency when going forward down a very steep slope, 50 to 60 percent. Brake vehicle by shifting to reverse (R) on slope of hill. Stop before shifting into or out of reverse. When you go down, speed up engine to increase braking and to keep engine from stalling.

CAUTION

Steers opposite when shifted to reverse.
Turn wheel right-move left.
Turn wheel left-move right.



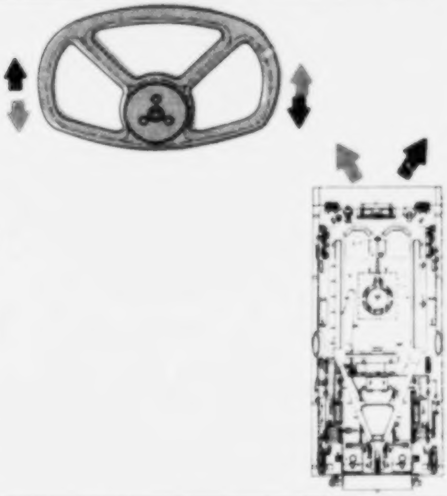
TA171235

Figure 2-16. Transmission shift selection (Sheet 2 of 2).

WARNING

Be careful when steering the vehicle. It does not handle like a car. Don't jerk it around. Injury to personnel and damage to equipment can result if you don't follow these instructions.

NORMAL STEERING-FORWARD



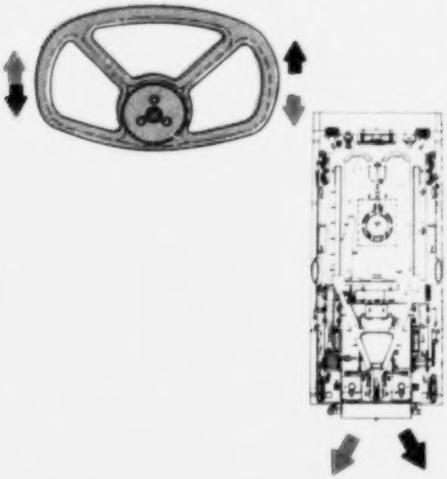
Transmission shift selection:

1st
2nd
3rd

NOTE

For larger wide turns turn steering wheel slightly in desired direction in 2nd or 3rd gear. 1st gear turns are sharper.

NORMAL STEERING-REVERSE



Transmission shift selection:

REVERSE (R)

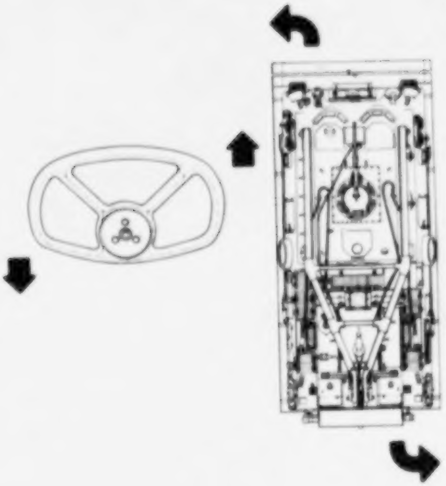
CAUTION

Steer opposite way a car does. Turn wheel right-move left. Turn wheel left-move right.

TA125538

Figure 2-17. Steering instructions (Sheet 1 of 3).

PIVOT STEERING



Transmission shift selection:

NEUTRAL (N)

NOTE

Stop vehicle before shifting to neutral.

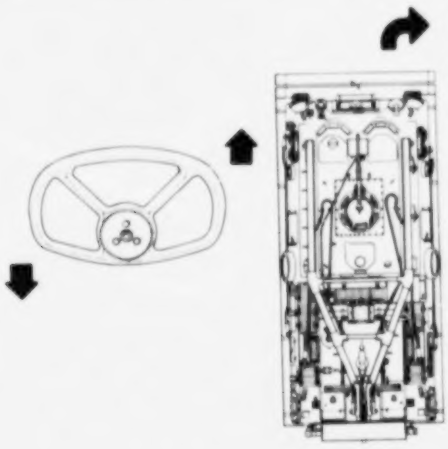
NOTE

Turn steering wheel full turn to desired direction and accelerate engine slowly.

CAUTION

Sudden turn can throw track. Turn on smooth level ground.

FORWARD DOWNHILL STEERING - IN REVERSE GEAR



Transmission shift selection:

REVERSE (R)

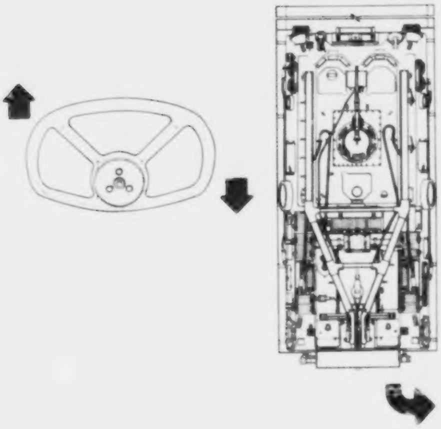
CAUTION

Moving in one direction with opposite gear selected for braking is used ONLY in extreme conditions. Vehicle must be STOPPED before shifting.

Figure 2-17. Steering instructions (Sheet 2 of 3).

TA171583

BACKWARD DOWNHILL STEERING - IN FORWARD (1st) GEAR



Transmission shift selection:

1st

CAUTION

As stated above, use the reverse gear for braking ONLY in extreme conditions. Vehicle must be STOPPED before shifting to reverse.

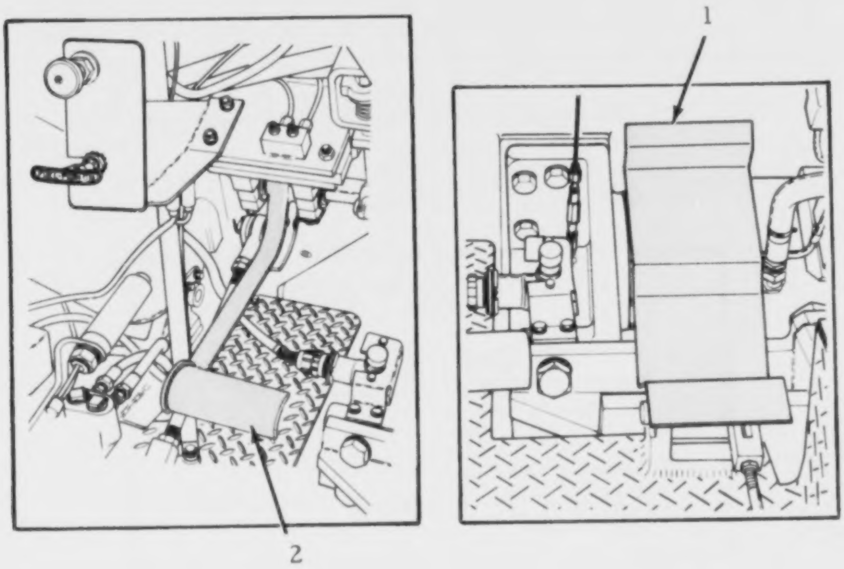
TURNING IN SAND

1. When turning in sand, shift 2nd or 3rd gear and make gradual turns.
2. If you make sharp turns in 1st gear, the track will be thrown. This is because of sand build-up on the track.

Figure 2-17. Steering instructions (Sheet 3 of 3).

TA125540

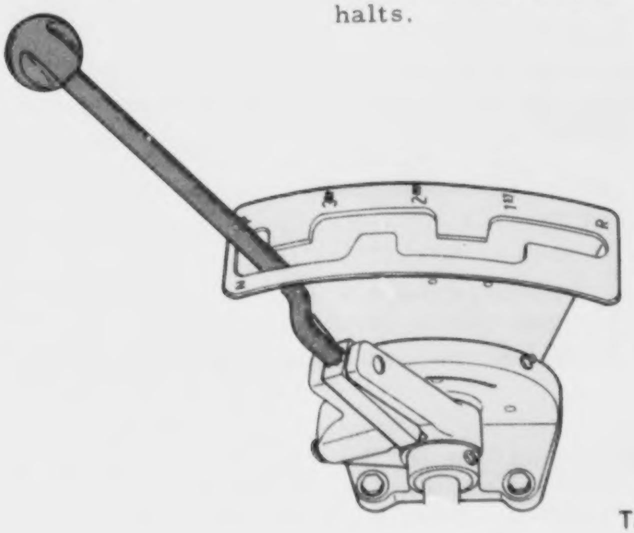
1. Release accelerator pedal (1) and slowly depress brake (2).



2. When you come to a complete stop, shift to P and lock brake.

NOTE

Increase engine idle to 1,000 to 2,000 rpm for long halts.



TA171236

Figure 2-18. Stopping the vehicle.

(1) When you approach an obstacle (3½ feet maximum height), release the accelerator, apply the brake and shift to low (1st) gear.

(2) Apply full power when starting over the obstacle, release the accelerator pedal on reaching the crest and permit vehicle to settle over it. Balance vehicle forward of crest so it begins to go down.

(3) When front of tracks touch ground, add power and move on.

e. Starting Vehicle on an Upgrade. When the vehicle is headed uphill, apply power before releasing the brake to avoid rolling backward.

CAUTION

1. Do not use transmission as a braking source for a long period of time. Transmission will overheat.
2. Using the service brakes too long will burn them out. Release and apply brakes occasionally to cool them off.

f. Going Down Steep Grades. When going down a steep hill, shift transmission to 1st. Apply the brake now and then to help slow down. In an emergency on a long descent:

(1) STOP VEHICLE.
(2) Shift into reverse (R) when headed down the grade.
(3) Open the throttle enough to brake vehicle and keep engine from stalling.

CAUTION

Steering direction is reversed when in reverse gear, so be careful. See figure 2-17.

g. Driving Down a Steep Hill Backwards. In an emergency, stop and shift into 1st when headed down the hill and use the engine as a brake. This prevents the service brakes from burning out. Brake only when necessary.

WARNING

Secure covers, doors and hatches before moving vehicle to avoid injuring personnel.

h. Climbing Steep Grades on Uphill Recovery Operations. Be sure the forward tank fuel valve (AR, fig. 2-8) is closed. This prevents the fuel from draining into the rear tanks and starving the fuel pump.

2-16. Stopping the Main Engine.

See figure 2-19.

NOTE

Fill the fuel tanks when you're finished with daily operations to prevent condensation. Use DIESEL FUEL only.

2-17. Towing Operations.

a. Equipment. All the equipment needed for towing operations is stored on the vehicle. The equipment location is shown in figure 2-20.

b. Towing Precautions. The following precautions should be followed to insure safety to personnel and equipment.

(1) Vehicle engines will be shut off and brakes applied while tow cables are being connected or disconnected.

(2) The main guns on towed vehicles will be pointed away from the M88A1 to prevent impact in case of a collision.

(3) Place the exhaust deflector in the center position, on both sides, during towing operation.

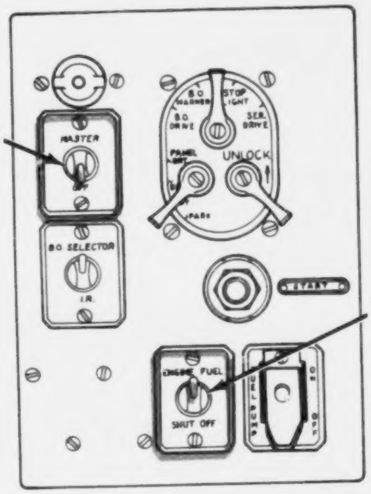
(4) An observer must be used to assist the operator when rigging the vehicle and during towing operations.

TA038821

1. Stop vehicle (fig. 2-18).

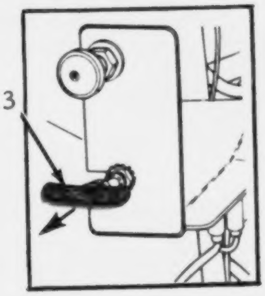
2. Idle the engine at 1,000 to 1,200 rpm for 3 to 5 minutes to cool it. Bring idle down to 675 to 725 rpm after the cooling period.

3. Hold the ENGINE FUEL SHUTOFF switch (1) down until the engine stops.


2
MASTER
OFF
B.O. SELECTOR
I.R.
B.O. MARKER
STOP LIGHT
B.O. DRIVE
SER. DRIVE
PANEL LIGHT
UNLOCK
PARK
START
1
ENGINE FUEL
SHUT OFF

NOTE

If engine fails to shut off pull the fuel shutoff handle (3) until engine stops. Notify organizational maintenance.

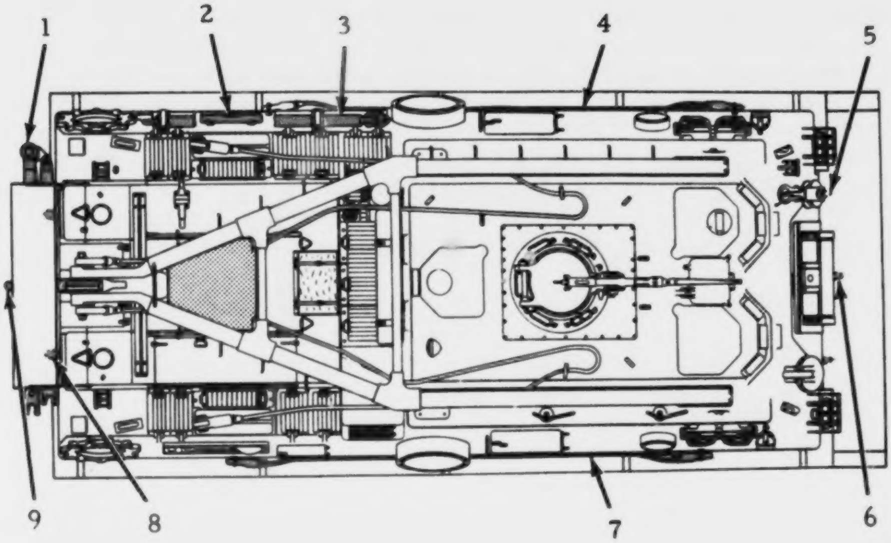


4. Turn off all radio and electrical switches.

5. Turn MASTER switch (2) OFF.

TA038822

Figure 2-19. Stopping the main engine.



1. Tow bar
2. Shackles and hooks
3. Tow bar
4. Tow cable
5. Towing eyes (3)
6. Towing eye
7. Tow cable
8. Towing eyes (2)
9. Towing pintle

TA125541

Figure 2-20. Towing equipment on vehicle.

NOTE

The M88A1 is authorized to tow only one vehicle at a time.

c. Towing Speeds. When towing another vehicle, you should maintain the following speeds:

13 mph ..	hard, level, smooth road (tow bar used)
2-1/2 mph	hilly or level cross-country (tow cables used)

These figures are only averages. You might have to go slower for safe traveling. Check with the operator's manual of the vehicle being towed.

d. Connecting Tow Bar. See figure 2-21. Use the tow bar when traveling over level ground. Tow cables will be used when towing over rough ground or cross-country.

e. Connecting Tow Cables. See figure 2-22.

f. Towing the M88A1. See figure 2-23.

g. Towing a Disabled Vehicle. See figure 2-24.

2-18. Operations of the Caliber .50 Machinegun.

Refer to FM 23-65 and TM 9-1005-213-10 for instructions on how to operate and maintain the caliber .50 machinegun.

2-19. Preparing the Hydraulic System for Operation.

a. Main Hydraulic System. See figure 2-25 for steps needed to prepare the main hydraulic system for operation.

b. Auxiliary Hydraulic System. See figure 2-26 for steps needed to prepare the auxiliary hydraulic system for operation.

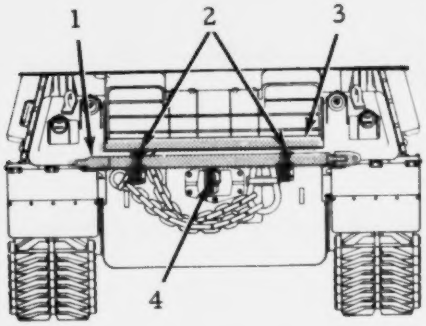
2-20. Spade Operation.

a. Controls. The spade is powered by the main or auxiliary hydraulic system. The controls are located in the operator's area. See figure 2-27 for operating instructions.

1. The tow bar (1) is stowed on the rear of the vehicle. Two clamps (2) hold it in place. A spare tow bar is stowed on the left side of the vehicle.

Exhaust deflector (3) positions:
   a. Full down - normal travel.
   b. Half up - while towing.
   c. Full up - hooking up or stowing towing equipment.

The tow bar will be attached to the towing pintle (4) of the towing vehicle.



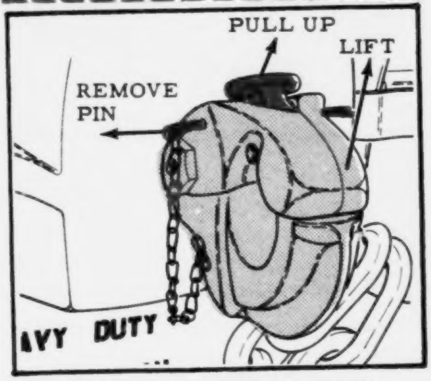
2. The pins needed to attach the tow bar are on the clevis ends of the bar.

Remove the bar and pins. Place the clevis ends over the towing lugs of the disabled vehicle and insert the clevis pins and locking pins.

Connect the lunette end of the tow bar to the towing pintle of the M88A1 by carefully moving the vehicle into position.

WARNING

Use extreme caution to prevent injury to personnel.



PINTLE OPERATION

3. Check the operator's manual of the disabled vehicle before you start towing. Special services might have to be done. Keep a speed of about 13 mph for towing on hard level ground.

TA038824

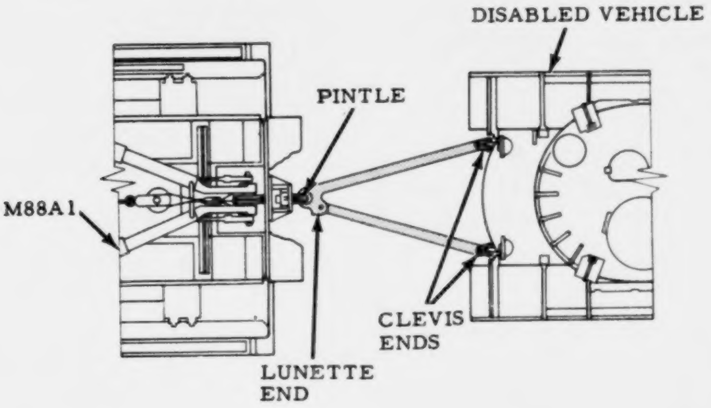
Figure 2-21. Connecting tow bar (Sheet 1 of 2).

CAUTION

Don't use a tow bar for cross-country towing. Tow cables are supplied for this.

NOTE

The M88A1 is authorized to tow only 1 vehicle at a time.


DISABLED VEHICLE
PINTLE
M88A1
CLEVIS ENDS
LUNETTE END

TA038825

Figure 2-21. Connecting tow bar (Sheet 2 of 2).

1. Use tow cables when towing over rough, uneven ground (cross-country).

   Position the rear of the M88A1 in front of the disabled vehicle.

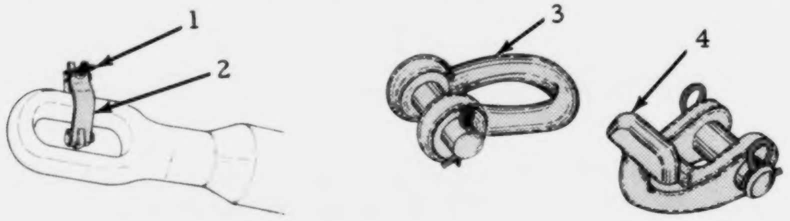
   Loosen the wingnut (1) on each clamp and pull clamp (2) off of cable ends.

2. Attach the tow cables to the M88A1. Put the tow cable shackle (3) through the cable end and the towing eye. Insert the clevis pin and the locking pin.

   Attach the hooks (4) to the disabled vehicle towing lugs.

WARNING

Before you hook up the cables, be sure you turn the engine off and set the brakes in both vehicles.



CAUTION

Do not bend or loop cables when rigging vehicles for towing. This will weaken cables and cause rigging to break. Cross cables as shown on the following page.

3. Put free end of tow cables over tow cable hooks.

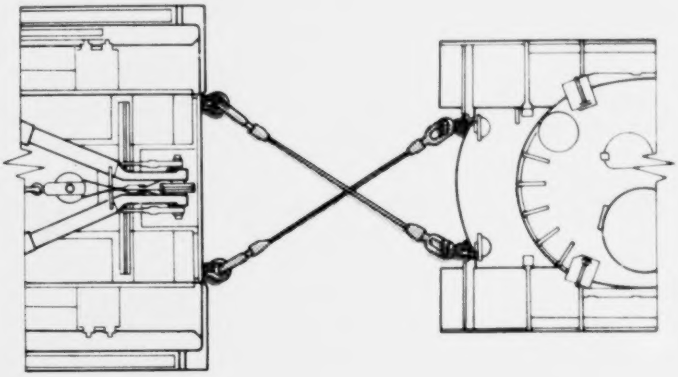
4. Keep the speed around 2-1/2 mph when towing cross-country. When using cables for towing, you must have a third vehicle. This is to hold back disabled vehicle if the final drives have been disconnected. Refer to FM20-22 for procedures. Check the operator's manual of the disabled vehicle before towing.

TA038826

Figure 2-22. Connecting tow cables (Sheet 1 of 2).

The final drives on tracked vehicles, other than the M88A1, will be disconnected on the disabled vehicle if it is to be towed more than ¼ mile.

Disconnect as instructed in that vehicle's manual.

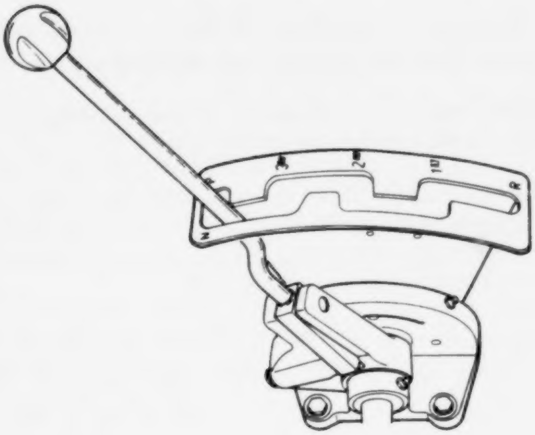


TA171237

Figure 2-22. Connecting tow cables (Sheet 2 of 2).

1. Connect the tow bar (fig. 2-21) or tow cables (fig. 2-22).

2. Shift the transmission to N.



CAUTIONS

a. Don't use the M88A1 brakes continuously. They will burn out.

b. If tow cables are used to tow an M88A1 less than 1/4 mile, a driver must be stationed on the M88A1 to operate the brakes.

c. When a vehicle other than an M88A1 is used for towing be sure its towing pintle is strong enough to take the load.

d. Do not disconnect the final drives unless transmission problems are suspected. If transmission problems are suspected, disconnect final drives to prevent further damage to the transmission. If the M88A1 is going to be towed with cables more than 1/4 mile, have a third vehicle hookup with a cable behind the vehicle to act as a braking unit. Refer to FM 20-22 for procedures.

e. Do not tow the M88A1 backwards with the final drives connected. Always disconnect the final drives before towing the vehicle backwards.

f. Do not tow the M88A1 faster than 12 mph with tow bar on level ground or 2-1/2 mph with tow cables.

Figure 2-23. Towing the M88A1.

TA171584

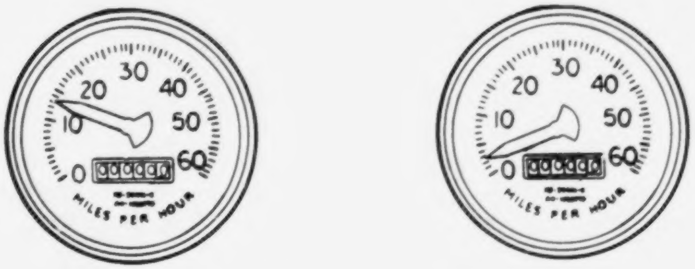
1. Position M88A1 in front or behind disabled vehicle.

2. Connect tow bar (fig. 2-21) or cables (fig. 2-22).

3. Refer to operator's manual of the disabled vehicle for gear position and speed for towing.

4. Shift transmission to 1st gear to get rolling and then to 2nd gear if ground conditions permit.

5. For towing on hard, flat ground with tow bar, keep the maximum speed under 13 mph. When you are towing cross-country using cables, keep the maximum speed around 2-1/2 mph.



Hard, flat ground with tow bar.

Cross-country with tow cables.

CAUTION

These speeds are for good ground conditions. Go slower if ground is unsafe.

6. To steer the vehicles, use a series of short turns. This will help keep the vehicles in line.

TA038829

Figure 2-24. Towing a disabled vehicle.

CAUTION

Do not operate hydraulic system with hoses disconnected.

1. Depress brake and shift transmission to park (P).

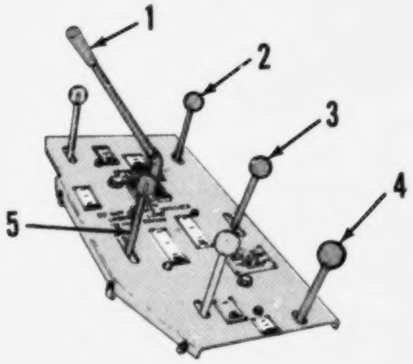
2. Start the engine (fig. 2-11) and run it at low idle (675 to 725 rpm).

3. Place all hydraulic levers in neutral (SYSTEM SELECTOR control lever (2) in MAIN). Move the POWER control lever (4) to ON. Check APU emergency winch control valve (fig. 2-26) for NORMAL OPERATION.

CAUTION

Hydraulic operation above 170°F not recommended. High oil temperature may cause abnormal system performance.

4. Speed up engine to 1,000 rpm and wait 5 to 10 minutes to let oil circulate and warm up.



TA171275

Figure 2-25. Preparing the main hydraulic system for operation (Sheet 1 of 2).

NOTE

For cold weather operation - increase engine to 1,800 rpm, be sure spade is locked and move SPADE operating lever (1) to RAISE for 3 to 4 minutes. This will cause oil to spill over the relief valve for faster warm up.

5. Return engine to low idle. Be sure both shift levers are in NEUTRAL (8 and 9, fig. 2-5, Sheet 10). With systems in a no load condition, circulate oil through the main and hoist winch systems. Move HOIST WINCH operating lever (5) to RAISE and LOWER. Move MAIN WINCH operating lever (3) to INHAUL and PAYOUT. Do this 3 or 4 times.

6. Slowly increase engine speed to 1800 rpm by using the hand throttle.

7. The hydraulic system is now ready for operation or draining.

NOTE

Refer to figure 2-27 for Spade Operation, figure 2-29 for Raising the Boom, figure 2-30 for Boom Operation, figure 2-32 for Hoist Winch Operation, and figure 2-33 for Main Winch Operation.

Figure 2-25. Preparing the main hydraulic system for operation (Sheet 2 of 2).

CAUTION

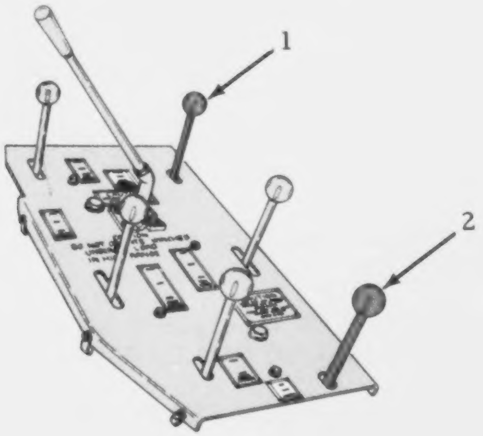
The auxiliary hydraulic system is used for the winches, boom and spade under NO LOAD conditions.

1. Check and keep the POWER control lever (2) OFF.

CAUTION

Do not operate hydraulic systems with hoses disconnected.

2. The SYSTEM SELECTOR control lever (1) must be in MAIN when starting the APU. Start the APU (fig. 2-34) and let the system warm up for 5 minutes.



3. To operate hoist and main winches under a no load condition:

   a. Be sure the APU emergency winch control valve (3) is in the AUXILIARY POWER UNIT OPERATION position.

TA038832

Figure 2-26. Preparing the auxiliary hydraulic system for operation (Sheet 1 of 3).

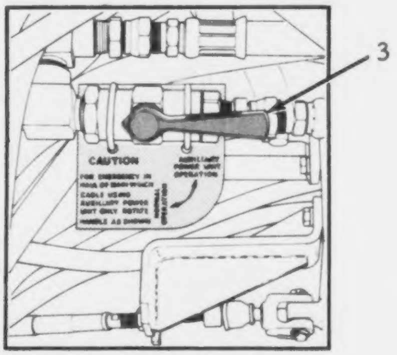
b. Move SYSTEM SELECTOR control lever (1) to AUX.

c. Shift MAIN or HOIST WINCH shift lever to HIGH only.

d. Operate MAIN WINCH operating lever (4, fig. 2-5, Sheet 9) or HOIST WINCH operating lever (6, fig. 2-5, Sheet 10).

NOTE

Located in mechanic's area on left hand side.



4. To operate the boom or spade under a no load condition:

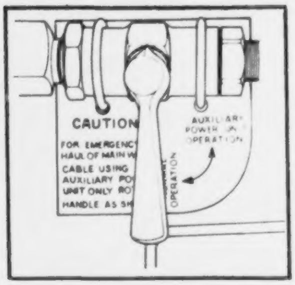
   a. Move the APU emergency winch control valve to the NORMAL OPERATION position.

   b. Move the SYSTEM SELECTOR control lever (1) to the AUX position.

   c. Operate the BOOM or SPADE operating lever. See figure 2-30 for boom operation or figure 2-27 for spade operation.

TA038833

Figure 2-26. Preparing the auxiliary hydraulic system for operation (Sheet 2 of 3).


CAUTION
FOR EMERGENCY
HAUL OF MAIN W
CABLE USING
AUXILIARY PO
UNIT ONLY RO
HANDLE AS SH
AUXILIARY POWER UNIT OPERATION
OPERATION

5. To operate the impact wrench or the refuel-defuel system:

   a. Check the APU emergency winch control valve for the NORMAL OPERATION position.

   b. Move SYSTEM SELECTOR control lever (1) to REFUEL.

   c. See figure 2-35 for refuel-defuel operation or figure 2-36 for impact wrench operation.

TA038834

Figure 2-26. Preparing the auxiliary hydraulic system for operation (Sheet 3 of 3).

1. Prepare main hydraulic system for operation (fig. 2-25).

NOTE

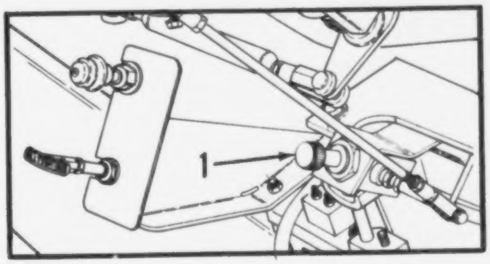
Refer to fig. 2-26 for using the auxiliary hydraulic system to stow spade.

2. The spade is used only to stabilize the vehicle when:

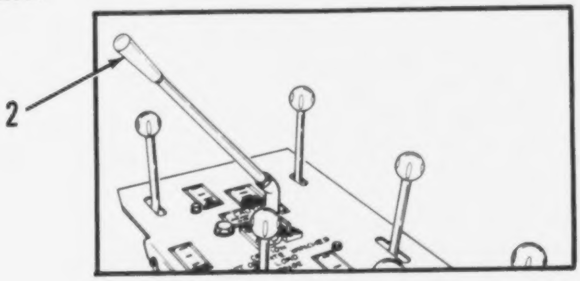
   a. Hoisting over 6 tons without lockout blocks installed.

   b. During all main winch operations.

3. Raise spade and release lock by pushing hydraulic spade lock release button (1).



4. Move SPADE operating lever (2) to LOWER, or RAISE for desired operation.



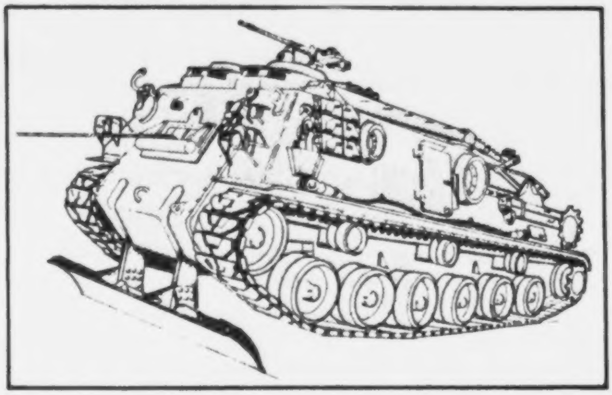
CAUTION

The spade may be used for light earth moving and leveling (dozing) for preparation of recovery only. Use only the lower edge of the spade to perform light earth moving. Do not dig the spade deep into the ground for use as a dozer blade.

Figure 2-27. Spade operation (Sheet 1 of 2).

TA171585

5. Lower the spade until it touches the ground. Keep the lever in LOWER, return the engine to idle, shift transmission to 3rd gear, release the brake and move the vehicle forward slowly. When it stabilizes over the spade, shift the lever to HOLD. Shift transmission to P and depress brake. Increase engine speed to 1,800 rpm and continue with recovery operation.



6. Backing off spade - move vehicle slowly in reverse and move SPADE operating lever to RAISE.

TA038836

Figure 2-27. Spade operation (Sheet 2 of 2).

b. Operation. The spade is used to stabilize the vehicle when hoisting loads over 6 tons. It will always be used for winching operations.

NOTE

The auxiliary hydraulic system is used for spade operations only in an emergency. See figure 2-26 for operating the auxiliary hydraulic system. Notify organizational maintenance if spade can't be raised to the locked position.

2-21. Boom Operation.

a. General. The boom is powered by the main or auxiliary hydraulic system. The operator controls the boom from the crew compartment.

WARNING

At no time during M88A1 MRV boom operations are personnel required to be positioned on the engine deck of the vehicle. The "A" shape of the boom support latch (Ref A, p. 2-94, Fig 2-31) is designed to guide the hoist winch cable out of the path of the retracting boom. Procedures to lay cable over the J-hook under the left side of the boom will be deleted from Ref A, p. 2-94.

NOTE

The auxiliary hydraulic system is used in an emergency to raise or lower the boom under a no load condition.

b. Rigging the Boom. See figure 2-28.

WARNING

- To avoid injury, do not stand on top of vehicle while boom is being raised or lowered.
- To avoid injury, do not stand on engine deck while operating boom. Boom support latch will guide hoist winch cable out of the path of retracting boom.
- To avoid damage to the boom and hydraulic system, always keep boom in stowed (travel lock) position when not in use.

c. Raising the Boom. See figure 2-29 for steps necessary to raise the boom to operating position.

d. Precautions to Follow When Raising the Boom.

(1) Chains supporting the tie block are not allowed to snag on the J-hook (3, fig. 2-31).

(2) Make sure the stayline cables (6, fig. 2-28) do not snag when raising the boom.

(3) Keep all ropes, stayline cables and other equipment from catching on the deck door hinges and handles to avoid damage and injury.

e. Operation. See figure 2-30 for instructions on operating the boom.

f. Lowering Boom. See figure 2-31 for steps in lowering the boom and securing it for traveling.

(1) See Fiqure 2-30 for instructions on normal operation of boom.

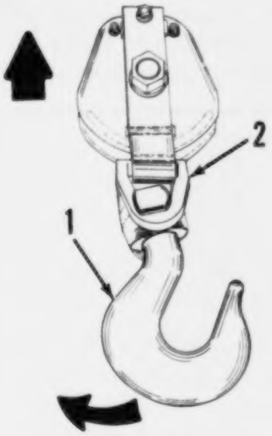
WARNING

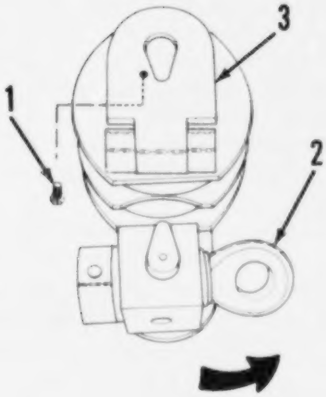
If powerplant is removed, and APU is non-operational, leave boom in full raised position. Do not attempt to lower boom; damage to boom, boom cylinders and hydraulic system could occur.

(2) Use APU to lower boom when powerplant is removed. Place 2 inch x 4 inch wood blocks on air cleaner outlet cover to support boom when engine deck is removed.

Two snatch blocks are provided for hoisting operations-one 10-ton and one 25-ton.

1. To rig the 10-ton snatch block for a 2-part line:
   a. Lay block in boom tray with hook forward.
   b. Swing the hook (1) out and lift the hinge (2).
   c. Lay the cable in the pulley and lower the hinge. Pull hook down to lock hinge.





2. To rig the 25-ton snatch block for a 4-part line:
   a. Lay the block in boom tray with clevis forward (1, view 3).
   b. Remove screw (1).
   c. Swing clevis (2) and lift hinge (3).
   d. Lay cables in snatch block. Be sure not to tangle or cross cables.
   e. Lower the hinge. Swing clevis back and replace the screw.

WARNING

Do not use 25-ton snatch block if screw (1) is not installed. If there is no hole in hinge for the screw, immediately notify organizational maintenance for installation. Failure to secure clevis to hinge with the screw (1) could result in the release of the snatch block during lifting operations possibly causing fatal injury.

NOTE

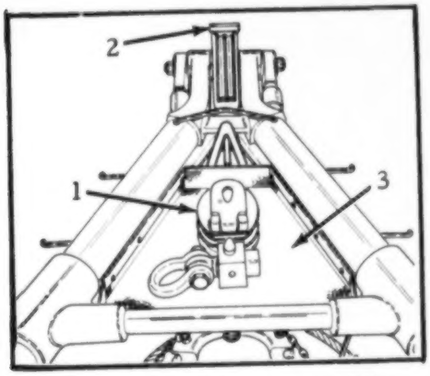
For replacement screw (1) use NSN 5305-00-269-2798.

Figure 2-28. Rigging the boom (Sheet 1 of 3).

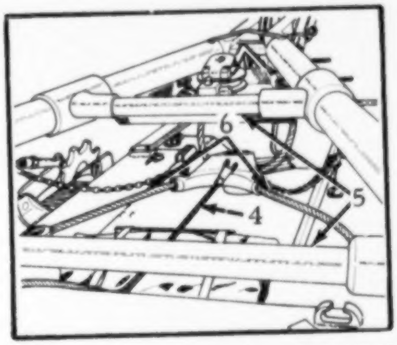
TA171586

CAUTION

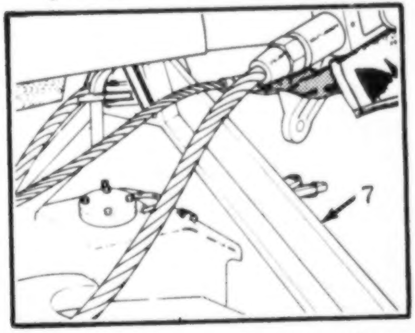
In order not to tangle the cable when rigging, read the following instructions carefully.



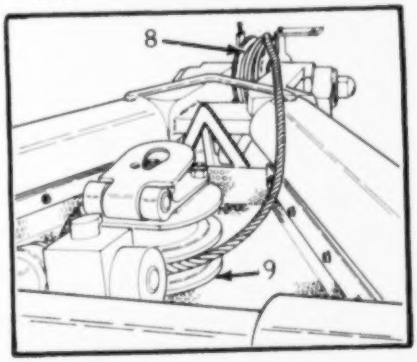
3. Place the 10-ton or 25-ton (1) snatch block in boom tray (3) with the open end of block facing forward. Open the boom pulley safety latch (2).



4. Have the operator pay out the hoist cable. Pass the cable (4) over the top of the crew compartment and under the boom cross members (5). Keep hoist cables between staylines (6).



5. Pass the cable up and over the left side of the boom support (7).



6. Bring the cable back, going up and over the left boom pulley (8).

7. Pull cable forward and lay it in the lower pulley (9) of the snatch block (25-ton) from left to right.

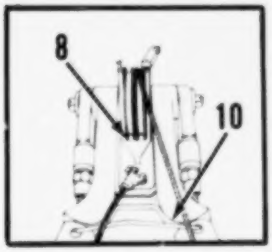
8. If you are rigging a 2-part line using the 10-ton snatch block, hook up the line to the dead man (step 13) and close the block.

TA125542

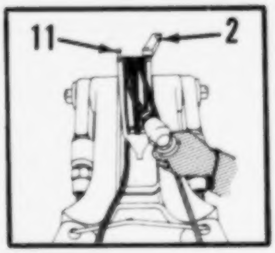
Figure 2-28. Rigging the boom (Sheet 2 of 3).

NOTE

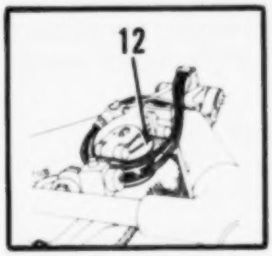
If you're rigging the 25-ton snatch block with a 4-part line, continue with the following steps.



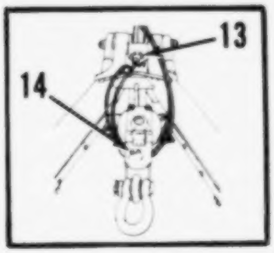
9. Bring the cable back over the upper boom cross member (10) and down under boom pulley (8).



10. Pull the cable up and over the right boom pulley (11).
11. Close the boom safety latch (2).



12. Bring the cable forward and lay it in the upper pulley (12) of the block from left to right.



13. Pull the cable toward the boom pulley and secure it to the deadman (13).
14. Close the snatch block. Replace and tighten screw (14).

WARNING

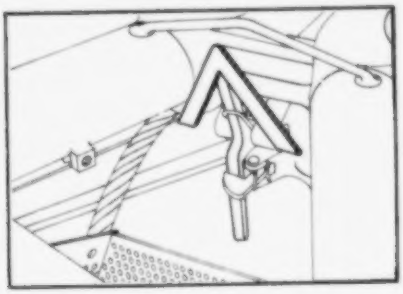
Do not use 25-ton snatch block if screw (14) is not installed. If there is no hole in the hinge for the screw, immediately notify organizational maintenance for installation. Failure to secure clevis to hinge with the screw (14) could result in the release of the snatch block during lifting operations possibly causing fatal injury.

Figure 2-28. Rigging the boom (Sheet 3 of 3).

TA171587

1. Prepare the main or auxiliary hydraulic system for operation (fig. 2-25 or 2-26).

2. Release boom latch and lock it in the unhooked position.



3. Move BOOM SAFETY control lever (1) forward to STOW position. Keep the BOOM SAFETY lever forward and move BOOM operating lever (2) to FORWARD position.

CAUTION

Make sure the stayline cables do not snag when you raise the boom.

NOTE

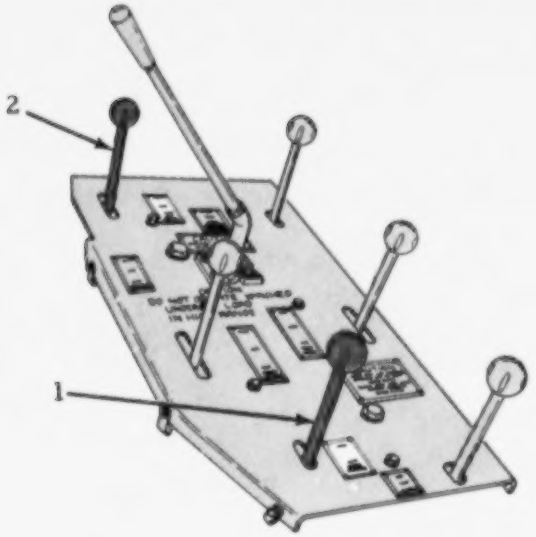
These levers must be engaged to operate boom with main engine only. When using the auxiliary hydraulics only use the BOOM operating lever (2).

NOTE

When you have the AUXILIARY HYDRAULIC position selected only the boom operating lever is needed to raise or lower the boom.

TA125544

Figure 2-29. Raising the boom (Sheet 1 of 2).



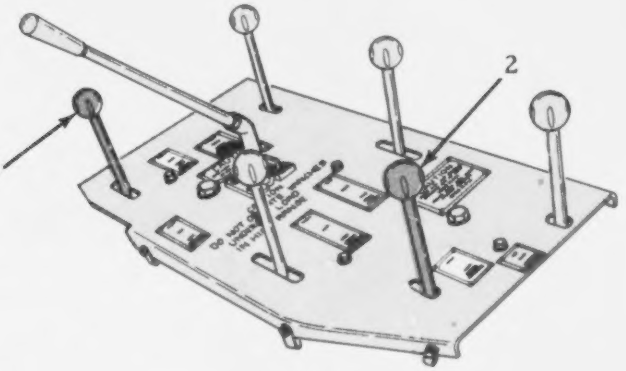
4. Release both levers when boom is fully raised. They will return to their normal positions.

TA038874

Figure 2-29. Raising the boom (Sheet 2 of 2).

1. To move boom back 4 feet, move the BOOM operating lever (1) to RETRACT-STOW.

2. To move boom forward, move the BOOM operating lever (1) to FORWARD.



NOTE

The vehicle can move with a load of 6 tons hanging from the boom. Moving loads of 6 to 20 tons requires lockout blocks. See paragraph 2-24 for instructions on lockout block installation.

3. Live boom operation is used to move the boom 1 to 4 feet back from the full forward position. This is for spotting (placing) loads during recovery or maintenance operations.

NOTE

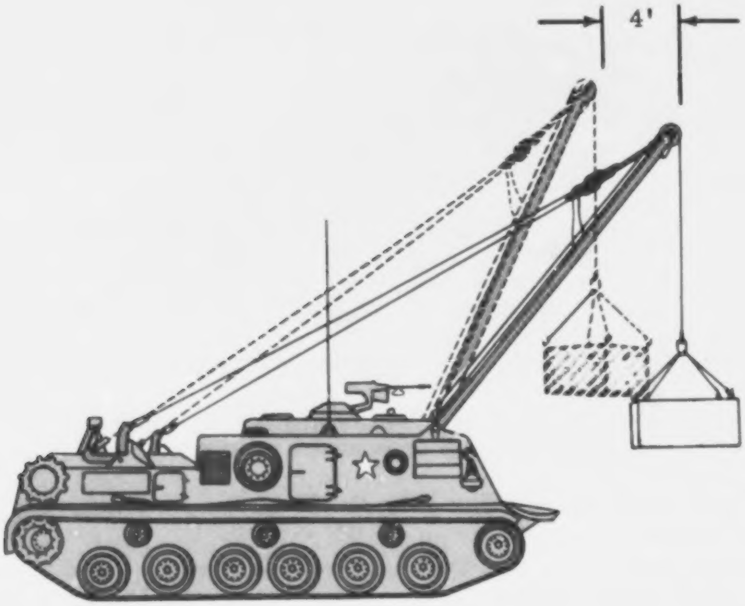
If you bring the boom all the way back (4 feet), you have to operate the BOOM SAFETY (2) and BOOM operating (1) levers to bring it forward again.

TA038875

Figure 2-30. Boom operation (Sheet 1 of 2).

CAUTION

Only operate the BOOM operating lever when retracting boom during live operation.



LIVE BOOM OPERATION.

CAUTION

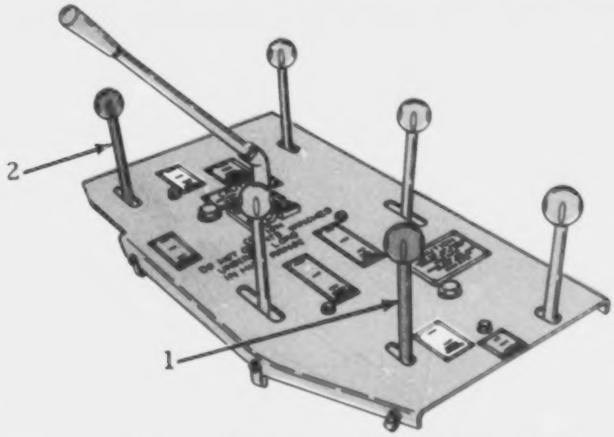
Maximum lift or live BOOM operation not to exceed 50,000 pounds.

TA125545

Figure 2-30. Boom operation (Sheet 2 of 2).

1. Before lowering the boom, raise the snatch block, if used, so it will lay in the boom tray when the boom is lowered.

2. Move the BOOM SAFETY control lever (1) forward to STOW. Move BOOM lever (2) back to RETRACT-STOW.



3. To keep the hoist cable from being damaged:

   a. Stop lowering boom by releasing control levers when boom is about 4 feet above engine deck.

   b. Lay hoist cable over J-hook (3) under left side of boom.

   c. Continue lowering boom. Release controls when boom is full down.

   d. Be sure boom latch (4) is locked to secure boom in stowed position before traveling. Secure stay-line cables before traveling.

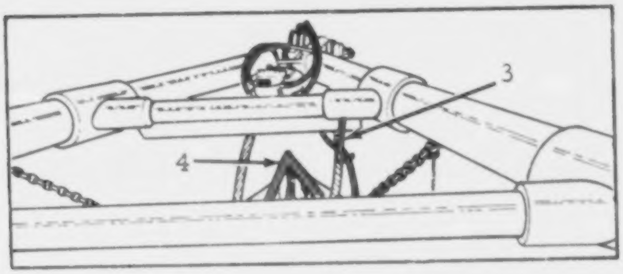


Figure 2-31. Lowering the boom.

2-22. Main and Hoist Winch Precautions.

a. An observer will be in view of both vehicle operators to direct operations.

b. Carefully inspect rigging before operation.

c. All personnel should stand clear (at least double the distance of cable) in case the lines break.

d. Apply power slowly to take up any slack.

e. No smoking or open flames will be permitted near disabled or overturned vehicles because of possible fire from spilled fuel.

2-23. Hoist Winch Operation.

a. Controls. The operator controls the payout and reelin speeds for the hoist winch cable by using the HOIST WINCH SHIFT lever. Speeds may also be controlled by using the HOIST WINCH operating lever.

b. Operation. See figure 2-32.

2-24. Lockout Blocks.

a. General. Lockout blocks are used when you have to lift and carry heavy loads. They prevent damaging the front suspension system. The blocks will be used for carrying loads from 6 to 20 tons.

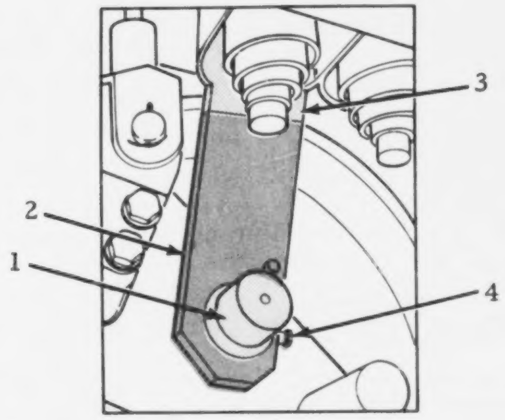
b. To Install the Lockout Blocks:

(1) Raise the front of the vehicle by lowering the spade (fig. 2-27).

(2) Slide the block (2) over the inside spindle (1) of the front road wheel on each side.

(3) Tighten the lock screw (4) to keep it in place.

(4) Lower the vehicle slowly and be sure that the block lines up with the bumper spring mounting (3).



c. For load limits and carrying speeds refer to the following:

	Vehicle speed-max.	
6 to 15 tons	3 mph	level, hard surface (gravel).
15 to 20 tons	2 mph	level, hard surface (smooth).

2-25. Main Winch Operation.

a. Controls. The operator controls the payout and reelin speeds for the main winch cable by using the MAIN WINCH SHIFT lever. Speeds may also be controlled by using the MAIN WINCH operating lever.

b. Operation. See figure 2-33.

c. Main Winch Capacities. The main winch is capable of pulling a maximum load of about 90,000 pounds. If you use a 2-part line, the system is capable of inhauling a load of about 180,000 pounds using the 90-ton snatch block. These loads can be used only when the main winch cable is almost fully payed out. Attach the 90-ton snatch block to the disabled vehicle and the line to the towing eye in the center or front of the M88A1.

TA038878

CAUTION

1. Never use the main winch with less than 3 wraps on the drum.
2. Minimum engine speed for winching operations is 1,500 rpm. Maximum speed is 1800 rpm.

1. Prepare the main or auxiliary hydraulic system for operation (fig. 2-25 or 2-26).

CAUTION

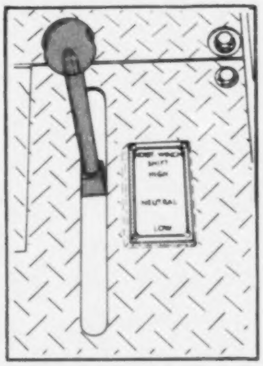
1. Never use hoist winch with less than 3 wraps on the drum.
2. Minimum engine speed for winching operations is 1500 rpm. Maximum speed is 1800 rpm.

2. Rig the boom for a single, 2- or 4-part line (fig. 2-28).

   a. Single part line - 12,500 pounds maximum load.
   b. 4-part line - 50,000 pounds maximum load.

3. Use the spade (fig. 2-27) or lockout blocks (para. 2-24) for loads over 6 tons.

4. Move the HOIST WINCH SHIFT lever to LOW or HIGH.



NOTE

If the shift lever will not engage in LOW or HIGH, move the HOIST WINCH operation lever to LOWER while keeping pressure on shift lever.

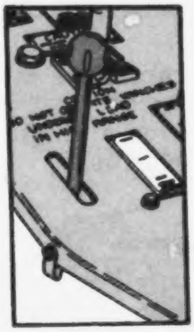
TA171239

Figure 2-32. Hoist winch operation (Sheet 1 of 2).

5. Move HOIST WINCH operating lever to LOWER or RAISE.

NOTE

Releasing operating lever holds load in position.



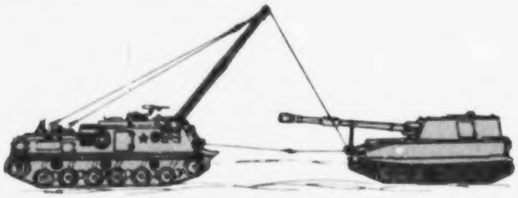
NOTE

Because the main winch cable is so heavy, the hoist winch may be used to help pay out the main winch cable. Rig the boom for a single line (fig. 2-28).

WARNING

Always wear leather gloves when handling winch cable. Never allow cable to run through hands. Broken wires can cause painful injuries.

6. Shift hoist winch shift lever to HIGH only when paying out or paying in hoist winch cable without a load. Always handhold wire rope to keep some tension on rope during this type of operation.



HOIST WINCH USED TO PAY OUT MAIN WINCH CABLE.

TA125547

Figure 2-32. Hoist winch operation (Sheet 2 of 2).

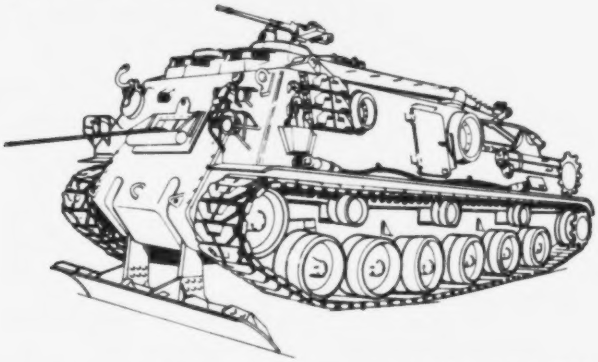
1. Prepare the main or auxiliary hydraulic system for operation (fig. 2-25 or 2-26).

CAUTION

Minimum engine speed for winching operations is 1,500 rpm.

2. Lower the spade to stabilize the vehicle (fig. 2-27).

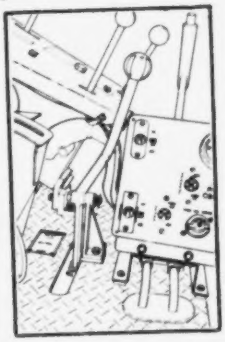
3. Rig the winch cable for a single line (90,000 lbs) or a 2-part line (180,000 lbs).



4. Move the MAIN WINCH lever to LOW or HIGH.

NOTE

If the MAIN WINCH SHIFT lever will not engage in LOW or HIGH, slowing move the MAIN WINCH operating lever to PAY OUT while keeping pressure on the shift lever.



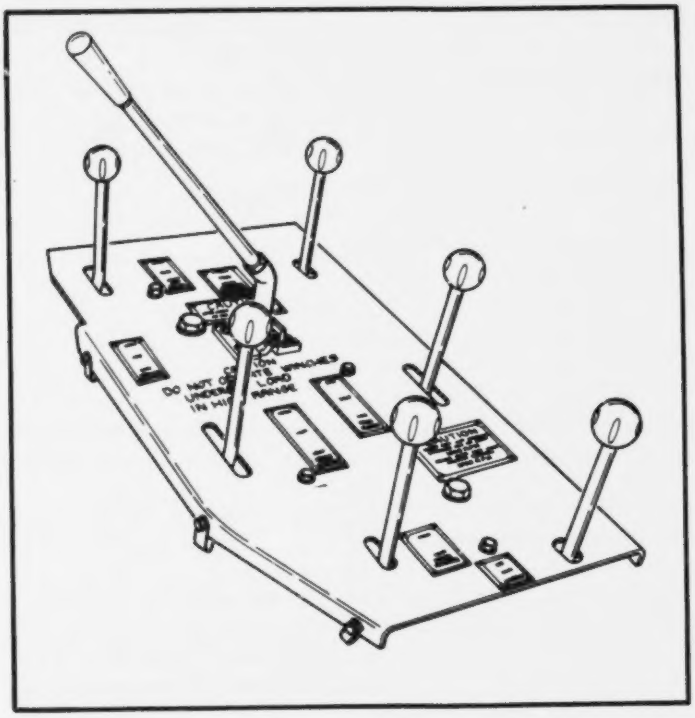
TA038882

Figure 2-33. Main winch operation (Sheet 1 of 2).

5. Move the MAIN WINCH operating lever forward to pay out cable or back to inhaul cable.

CAUTION

Do not reel in cable under load in HIGH gear. Reel in cable under a load heavy enough to keep cable tightly drawn and off the ground.


CAUTION
DO NOT O ATE WINCHES
UNDER LOAD
IN HI RANGE
CAUTION

6. When you release the operating lever, it will return to HOLD and the cable will stay where it is.

Figure 2-33. Main winch operation (Sheet 2 of 2).

TA171588

Section V. OPERATION OF AUXILIARY EQUIPMENT

2-26. General.

This section describes the operation of the following items:

(1) Auxiliary power unit................Fig. 2-34

(2) Fuel transfer pump.................Fig. 2-35

(3) Impact wrench.....................Fig. 2-36

(4) Personnel heater..................Fig. 2-37

(5) Ventilating blower.................Fig. 2-38

(6) Portable and fixed fire extinguishers. Fig. 2-39 and Fig. 2-40

(7) Vehicle jacks......................Fig. 2-41

CAUTION

Read each set of instructions completely before operating the equipment to avoid damage or injury.

2-27. Auxiliary Power Unit Operation.

a. General. The auxiliary power unit (APU) is used to charge the vehicle batteries. It also powers the fuel transfer pump and the hydraulic impact wrench. The APU provides EMERGENCY hydraulic power to operate the following only if the engine fails.

(1) Main Winch - pay out cable to loosen load and/or inhaul cable under no load conditions.

(2) Hoist Winch - raise cable under no load conditions.

NOTE

In an EMERGENCY ONLY - if the main engine fails during hoisting operations and you have a load hanging from the boom, the auxiliary hydraulic system may be used to lower the load. This is to allow you to loosen the cable and reel it in. Start the auxiliary hydraulic system (fig. 2-26) and move the HOIST operating lever SLOWLY to LOWER until the load rests on the ground.

CAUTION

This is not a normal function of the auxiliary hydraulic system.

(3) Spade - raise or lower under no load condition. The spade can be raised from the stabilizing position by releasing the vehicle brakes while raising it. If the spade is deeply implanted, the vehicle must be towed back while raising the spade.

(4) Boom - raise or lower under a no load condition.

b. Starting Instructions. See figure 2-34 for normal starting instructions. Instructions for starting the APU in extremely cold weather (0° to -25°F) are found in paragraph 2-41d. Before starting the APU, see the Preventive Maintenance Checks and Services (table 3-1) for checking oil level.

c. Charging the Batteries. To charge the batteries, start APU and run it for 3 minutes. Turn on the generator switch and charge for 30 minutes. If there is not enough power to start the main engine after charging test batteries for serviceability (TM 9-2350-256-20 Page 2-256 section 2-81b).

2-28. Refuel and Defuel.

a. General. The transfer fuel pump is used when fueling the vehicle from drums or from another vehicle. It is also used to transfer fuel from the M88A1 to another vehicle. The controls and the fuel hose are in the right stowage compartment on the outside of the vehicle.

b. Operation. See figure 2-35. Table 2-1 lists the flow regulator settings.

CAUTION

Turn off radio and electrical switches before starting the APU.

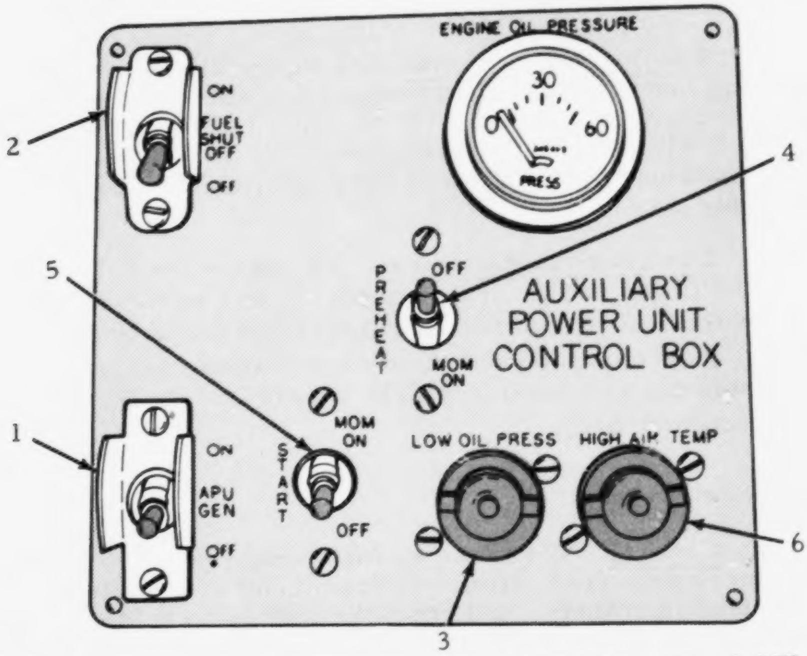
1. Before starting the APU:

    a. Be sure the hydraulic SYSTEM SELECTOR control lever is on MAIN (2, fig. 2-5, Sheet 9).

    b. Check the hydraulic POWER lever for OFF (5, fig. 2-5, Sheet 10).

    c. Turn MASTER switch ON and FUEL PUMP switch OFF (1 and 5, fig. 2-5, Sheet 7).

    d. Check the APU generator switch (1) for OFF.


ENGINE OIL PRESSURE
30
0
60
PRESS
2
ON
FUEL SHUT OFF
OFF
4
5
PREHEAT
OFF
MOM ON
AUXILIARY POWER UNIT CONTROL BOX
1
ON
APU GEN
OFF
START
MOM ON
OFF
LOW OIL PRESS
HIGH AIR TEMP
6
3

2. Turn the FUEL SHUTOFF switch (2) ON. The LOW OIL PRESSURE light (3) will come on and stay on until the engine runs.

TA038886

Figure 2-34. Starting the auxiliary power unit (Sheet 1 of 3).

3. The PREHEAT switch is kept on until engine starts.

4. Hold the PREHEAT switch (4) down for:

   a. 20 seconds if it is above 55°F.

   b. 1 minute if it is below 55°F.

NOTE

If it's extremely cold weather (0° to -25°F), see fig. 2-45 for cold weather starting instructions.

5. Turn the START switch (5) ON and hold until the engine starts. If it doesn't start in 1 minute, release the START switch and keep the PREHEAT switch down for another 20 seconds or 1 minute. Try again. If it still doesn't start, troubleshoot (table 3-2).

6. When engine starts, release the 2 switches (4 and 5).

CAUTION

If the LOW OIL PRESSURE light (3) stays on after engine starts or comes on while engine is running, turn FUEL SHUTOFF switch (2) OFF. This stops the APU.

7. Let the APU warm up for 3 minutes before turning on the generator switch or operating the auxiliary hydraulic system.

CAUTION

Do not run the APU for longer than 1 hour with generator or hydraulics engaged in a heavy load condition. After 1 hour, turn off auxiliary generator or hydraulic system. Then run engine to allow it to cool before engaging hydraulics or generator again.

TA038887

Figure 2-34. Starting the auxiliary power unit (Sheet 2 of 3).

CAUTION

If HIGH AIR TEMPERATURE light (6) comes on during operation, turn off the APU and let it cool. If the light comes on often, notify organizational maintenance.

8. While the APU is operating, frequently check the APU control box for possible malfunctions.

9. To stop the APU, turn the generator and FUEL SHUTOFF switches to OFF.

10. If the FUEL SHUTOFF switch does not stop the APU, turn the MASTER switch OFF.

11. If the APU still runs, go outside to the APU compartment and turn OFF the emergency fuel shutoff valve (AF, fig. 2-8).

WARNING

The access door to the APU can swing shut and injure personnel performing maintenance checks and services on the unit, especially if the spare roadwheel is mounted in place on the hull, unless the door is properly secured by a strap. (Use stowage strap numbers, 4, 6, or 7, fig. B-3. The strap is routed through lower access door ring handle and the stowed roadwheel hub, and then tied to secure door in an open position).

Figure 2-34. Starting the auxiliary power unit (Sheet 3 of 3).

STARTING OPERATION

WARNING

No smoking or open flames are permitted during any refuel or defuel operation and the M88A1's portable CO_2 fire extinguisher must be manned and readily accessible.

1. Check the fuel tank FUEL CONTROL VALVES for the desired position (fig. 2-8, sheet 17).
2. Insure that the FUEL PUMP CONTROL handle (3) is on CLOSED.
3. Move the FLOW REGULATOR handle (4) to the 10 setting.
4. Select filler tube for desired operation, long tube (6) for refuel, and short tube (7) for defuel.
5. Place filter (8) in filler tube and screw the tube onto the nozzle (9) hand tight. (If leakage occurs the tube may be tightened slightly by wrench).
6. Remove fuel hose connection cap (1) and fuel hose plug (12) and connect the fuel hose (2).
7. Start the APU (fig. 2-34) and shift the SYSTEM SELECTOR CONTROL lever (5) to REFUEL.
8. Move FUEL PUMP CONTROL handle (3) to desired position (REFUEL places fuel into the M88A1, DEFUEL removes fuel from the M88A1).

CAUTION

Do not change FUEL PUMP CONTROL handle without setting FLOW REGULATOR handle on 10 setting.

9. Set FLOW REGULATOR handle (4) to desired position. Refer to table 2-1 for flow setting. Normal operating range will be 3.25 on flow regulator setting. This is about 25 gpm.

CAUTION

All personnel must dismount the vehicles and the manned fire extinguisher must be readily accessible.

10. Bond the fuel hose assembly by connecting the attached grounding cable (10) to the object to/from which fuel is being transferred.

11. Remove filler cap and insert tube firmly into fuel tank filler pipe. Avoid damaging filler pipes or strainers.

12. Avoid overfilling by attending the fuel nozzle constantly as lock or latch open devices that permit unattended operation are NOT AUTHORIZED (any nozzles which have the notched handles must have the notches removed).

CAUTION

When refueling the M88A1, remove fuel filler cap for venting and have an observer watch the fuel tank filler pipe to avoid overfilling and spillage of fuel.

SHUTTING DOWN OPERATION

1. Move FLOW REGULATOR handle to 10.

2. Set FUEL PUMP CONTROL handle to CLOSED.

3. Engage the nozzle handle to relieve fuel pressure in the hose. Remove tube from fuel tank filler pipe and replace filler cap.

4. Remove grounding cable.

5. Shift SYSTEM SELECTOR CONTROL lever to MAIN.

6. Shut down APU if you have no further need of it at this time.

7. Disconnect the fuel hose and replace hose connection cap and plug.

8. Insure the short tube with filter is installed on the nozzle with the dust cap (11) in place before the unit is stowed.

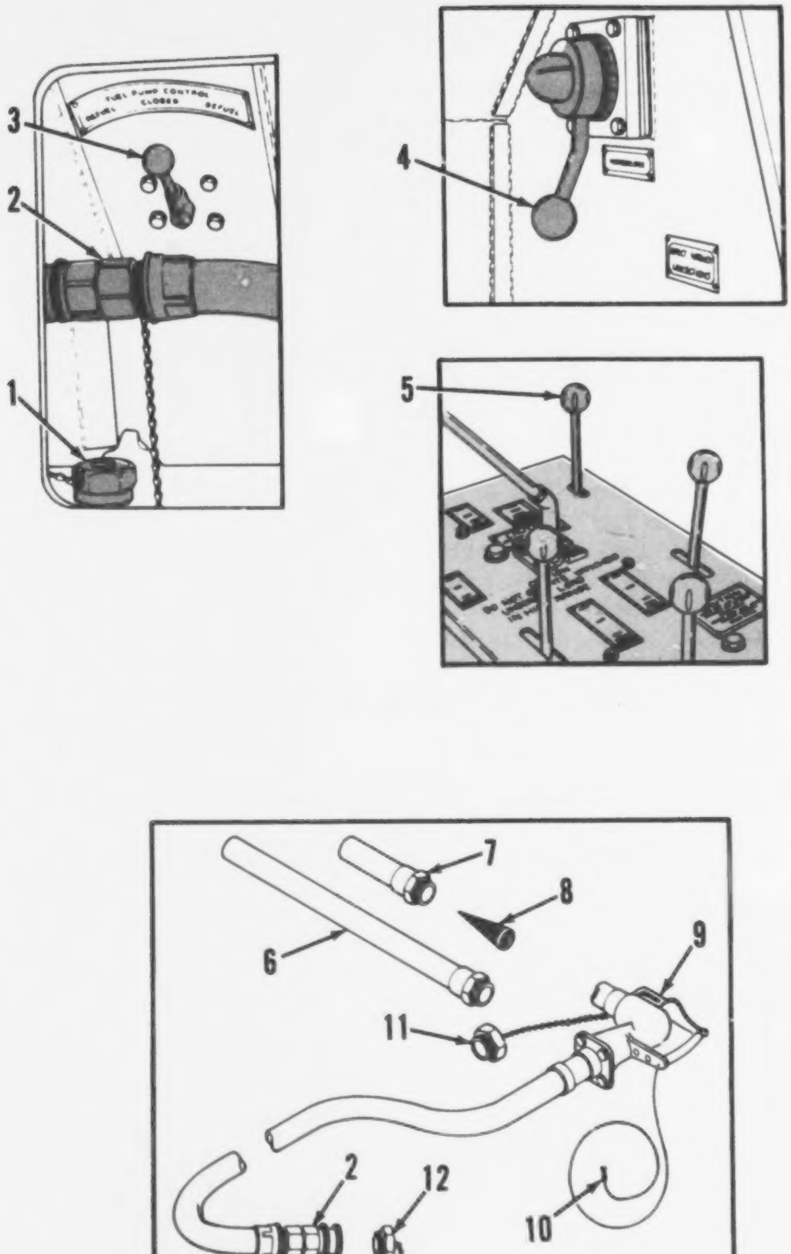

FUEL PUMP CONTROL
REFUEL
CLOSED
DEFUEL
3
2
1
4
5
7
8
6
9
11
2
12
10

Figure 2-35. Fuel transfer pump operation. TA100358

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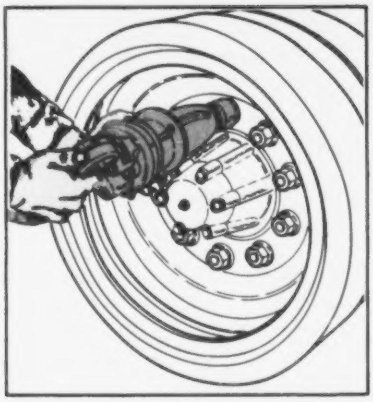
Table 2-1. Flow Regulator Setting for Operation of Impact Wrench and Fuel Transfer Pump

Flow regulator setting	Approx. flow output at regulator gpm	Av. torque output lb-ft		Approx. fuel transfer pump output gpm
		1-in. bolt at 5 secs.	1-in. bolt at 10 secs.	
0	6.3	Do not use	Do not use	36
0.50	6.2	Do not use	Do not use	35.5
1.00	6.0	Do not use	Do not use	35
1.50	5.8	Do not use	Do not use	34
2.00	5.5	Do not use	Do not use	33.5
2.50	5.1	Do not use	Do not use	33
3.00	4.5	Do not use	Do not use	29
3.25	4.1	940	Do not use	26.5
3.50	3.9	800	1000	24
3.75	3.5	620	770	21
4.00	3.2	490	580	18.5
4.25	2.8	360	480	16
4.50	2.4	305	450	14
5.00	1.7	---	---	9
5.50	1.1	---	---	3
6.00 thru 10.00	0	---	---	0

2-29. Impact Wrench Operation.



a. General. A portable hydraulic impact wrench with hoses is located in the right stowage compartment. It is a 3/4-inch square drive wrench with two 3/8-inch and two 1/2-inch quick disconnect, self-sealing hoses.

b. Operation. See figure 2-36 for operation of the wrench. Table 2-1 lists the flow regulator settings. For maintenance and operation of the wrench refer to TM 9-5130-338-15P.

2-30. Personnel Heater Operation.

The personnel heater gives off heated air for the crew compartment. See figure 2-37 for operation.

2-31. Ventilating Blower Operation.

The ventilating blower circulates fresh outside air throughout the crew compartment. For operation see figure 2-38.

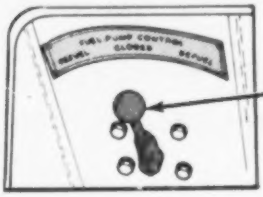
2-32. Portable Fire Extinguisher Operation.

a. General. Two portable fire extinguishers are located on the right and left rear side of the crew compartment. They are used to fight local fires inside and outside the vehicle.

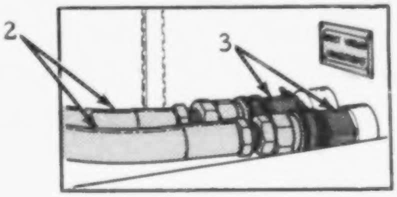
b. Operation. See figure 2-39.

TA038891

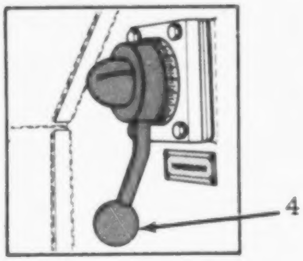
1. Check the FUEL PUMP CONTROL handle (1) for CLOSED position.



2. Connect impact wrench hoses (2) to quick disconnect couplings (3).

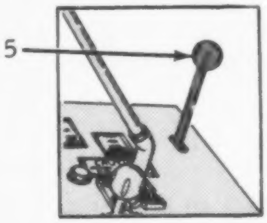


3. Move the FLOW REGULATOR control handle (4) to the 10 setting.



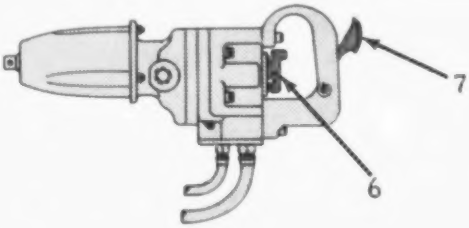
4. Turn on the auxiliary hydraulic system (fig. 2-26).

5. Shift the SYSTEM SELECTOR control lever (5) to REFUEL.



6. Adjust FLOW REGULATOR control handle for approximate torque settings. Check table 2-1. Also, check torque requirements for item being worked on.

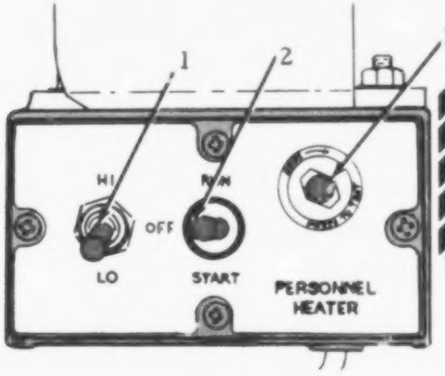
7. Set rotary switch (6) for direction of wrench rotation. Be sure switch is turned all the way left or right. Push and hold trigger (7) to operate wrench.



TA038892

Figure 2-36. Impact wrench operation.

1. Press indicator light (3) to see if it glows. If it doesn't glow, replace it. If it still doesn't glow, troubleshoot (table 3-2).
2. Deleted.
3. Set HI/LO switch (1) to desired position.
4. Hold the heater control switch (2) to START.



WARNING

Do not operate heater with vehicle breather closed.

5. Wait 2 to 4 minutes for the indicator light (3) to come on. Move heater control switch (2) to RUN.
6. If light (3) fails to glow, move heater control switch (2) OFF.
   a. Press indicator light. If it lights, wait 2 minutes and try to start the heater again.
   b. If it doesn't light, check troubleshooting table 3-2.
7. To stop heater, move heater control switch to OFF. Light will go out in a short time.

NOTE

The heater can be operated with the MASTER switch OFF. Run it like this for only a short time. The batteries will drain quickly in cold weather.

TA125548

Figure 2-37. Personnel heater operation.

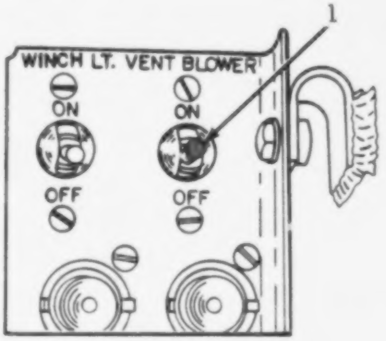
The MASTER switch (fig. 2-11, step 2) must be ON to operate the ventilating blower.

1. Turn the VENT BLOWER switch (1) on the accessories panel to ON.

2. Turn switch OFF to stop operation.

WARNING

DON'T operate the ventilating blower in an area where the air is contaminated.



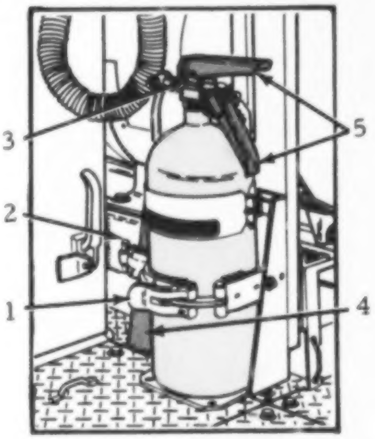
TA038894

Figure 2-38. Ventilating blower operation.

WARNING

1. Fire extinguisher CO_2 can cause suffocation and/or severe burns.
2. Handle the fire extinguisher carefully. Don't bang or drop the cylinder.

1. Pull latch (1) and remove fire extinguisher from the bracket (2).
2. To operate tank:
   a. Pull safety pin (3).
   b. Point cone (4) at base of fire.
   c. Squeeze handles (5).



WARNING

Do not touch cone when using extinguisher. Hands will be severely burned.

NOTE

Have organizational maintenance replace used extinguishers.

TA038898

Figure 2-39. Portable fire extinguisher operation.

2-33. Fixed Fire Extinguisher System Operation.

a. General. The system contains 2 banks of 4 cylinders each. Each bank discharges CO_2 into the engine, engine compartment, and hydraulic compartment. Two sets of pull handles are used to discharge the extinguishers.

b. Operation. See figure 2-40.

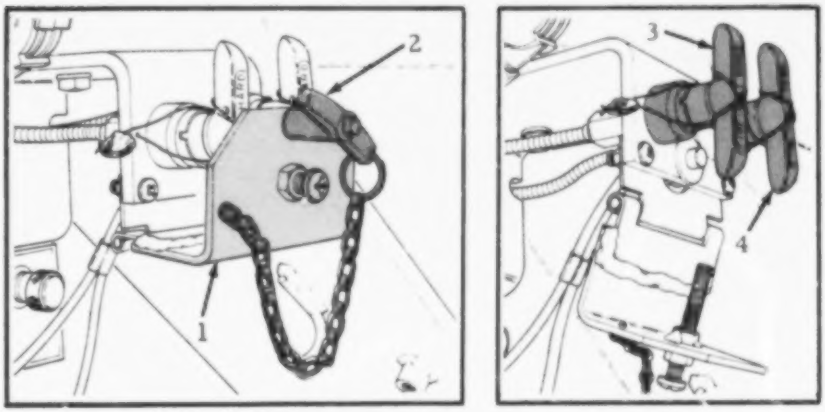
2-34. Vehicle Jack Operation.

a. General. Three vehicle jacks are stowed on the left side of the crew compartment behind the operator. A 12-ton and a 30-ton jack are on the oddment tray. The other 30-ton jack is under crew compartment access door (11, fig. 2-9).

b. Operation. See figure 2-41.

1. One set of fire extinguisher pull handles is located on the left wall of the crew compartment, just behind the driver.

2. The fixed extinguishers will put out electrical and fuel type fires in the hydraulic and engine compartments.



3. When it is necessary to discharge the fire extinguisher system, the shield (1) must first be removed from the pull handles. This is accomplished by depressing the pushbutton on the quick release pin (2), which allows the shield to pivot downward on its hinges, and away from the pull handles. This action simultaneously clears the handles for pulling and releases the pushbutton on the switch. When the pushbutton is released, the fuel shutoff solenoid is activated and the engine is shut off.

The rear handle (3) discharges the right bank. The front handle (4) discharges the left bank.

NOTE

Grab the handles TIGHT and pull HARD. If the fire is intense or if an explosion is possible, pull BOTH handles and GET AWAY FAST.

Figure 2-40. Fixed fire extinguisher operation (Sheet 1 of 2).

TA125549

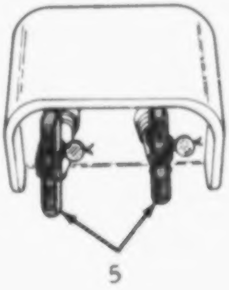
Before the vehicle can be restarted, the shield (1) must be replaced. This is accomplished by swinging it upward on its hinges and re-inserting the quick release pin (2).

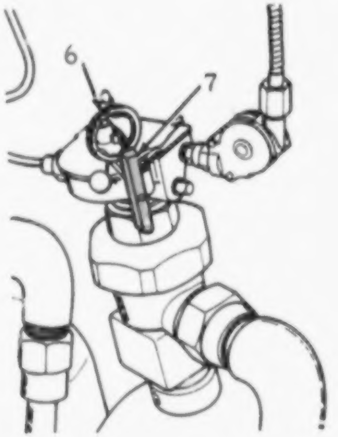
NOTE

Have organizational maintenance replace discharged cylinders.

4. Two pull handles (5) are located forward of the left personnel door on the outside. They operate the same way as the inside pull handles do.

5. The rear cylinder of each bank has a local discharge lever on it to operate that bank. Pull the locking pin (6) and push the lever (7) forward.





NOTE

Some vehicles with older serial numbers have pull handles mounted above the battery grilles.

Figure 2-40. Fixed fire extinguisher operation (Sheet 2 of 2).

TA125550

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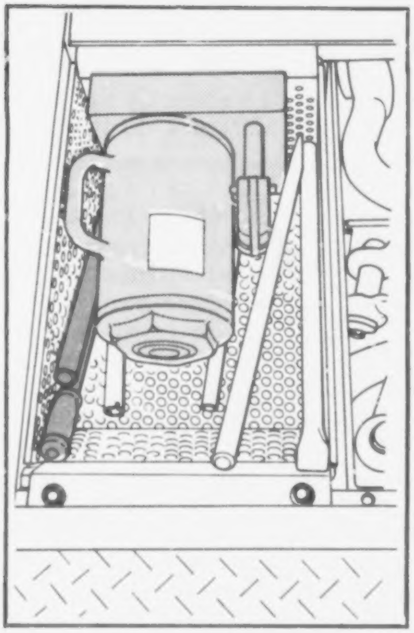
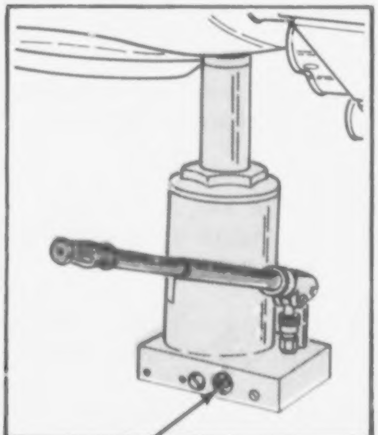
NOTE

The 12-ton and 30-ton jacks work the same way.



1. Open acess door (11, fig. 2-9) for 30-ton jack and handles (2 pieces).



2. To operate:
   a. Close valve (1) to the right before using.
   b. Place jack on hard, level ground.
   c. Connect handle and lift.
   d. To lower, unscrew valve (1) slowly.

TA038899

Figure 2-41. Vehicle jack operation.

Section VI. GAS-PARTICULATE FILTER UNIT

2-35. Description of Equipment.

WARNING

Do not expect your protective mask to protect you from carbon monoxide poisoning. It will not do it.

a. General. Each M8A3 gas-particulate filter unit supplies filtered air to 4 or fewer persons in the crew compartment. It removes all known chemical agents, dust and other particles from the air. Two units are installed in the vehicle. Filtered breathing air is supplied through the hoses to the M25A1 mask worn at each crew member and passenger station. See figure 2-42. Figure 2-43 shows the layout of the filter unit as it appears in the vehicle.

b. M2A2 Air Purifier. The air purifier assembly has an M13 particulate filter, an M12A1 gas filter and an M1A1 air purifier precleaner in a steel housing. The M12A1 gas filter has a flow of up to 12 CFM. Four outlet sockets are provided for the attaching hoses. When less than 4 crew members use the unit, one of the airflow sockets is covered by a control cap without a centerhole. The other sockets, when not in use, are covered with control caps with a centerhole.

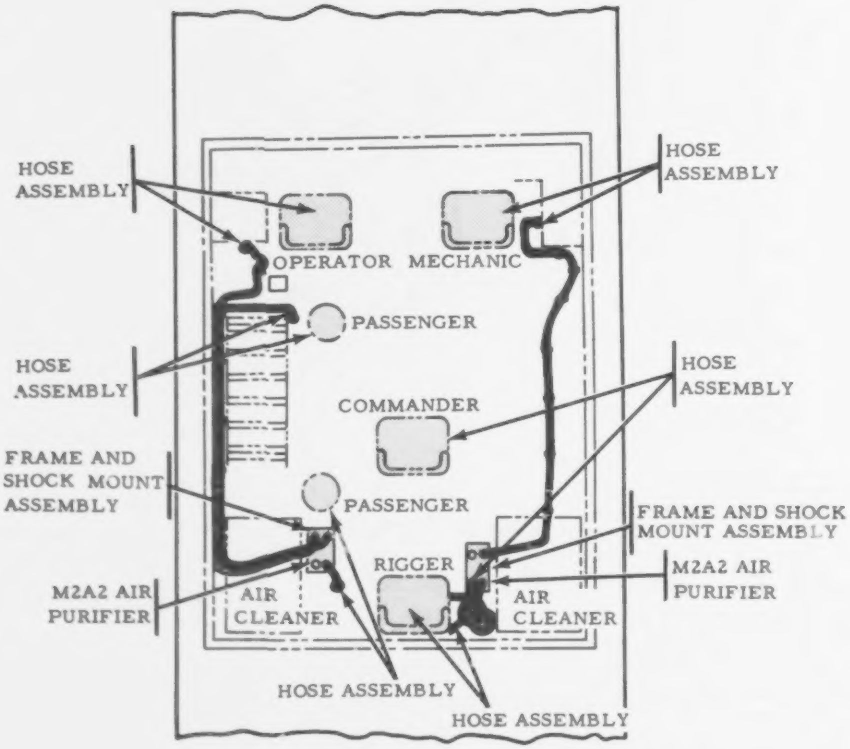
c. Hose Assemblies. Each hose has 2 coupling halves. One end attaches to the unit and the other attaches to the tank protective mask.

d. Cable Assemblies. Four cables are required for each M8A3 filter unit. They connect the filter unit, switch and circuit breaker to the dome light power receptacle.

e. Circuit Breaker and Switch Assembly. This controls the M8A3 filter unit and protects the unit against an electrical overload.

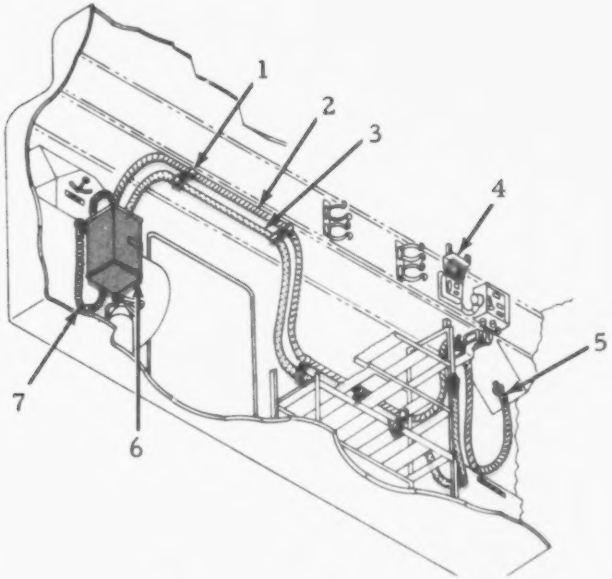
f. Spring Clip. The spring clip (1, top of page 2-125) covers the air holes in the center of the housing during shipment, storage, when not in use, and when the vehicle is being cleaned. During operation, the spring clip must be removed from the air intake holes by moving it down.

TA038900


HOSE ASSEMBLY
HOSE ASSEMBLY
OPERATOR
MECHANIC
PASSENGER
HOSE ASSEMBLY
HOSE ASSEMBLY
COMMANDER
FRAME AND SHOCK MOUNT ASSEMBLY
PASSENGER
FRAME AND SHOCK MOUNT ASSEMBLY
RIGGER
M2A2 AIR PURIFIER
M2A2 AIR PURIFIER
AIR CLEANER
AIR CLEANER
HOSE ASSEMBLY
HOSE ASSEMBLY

TA038896

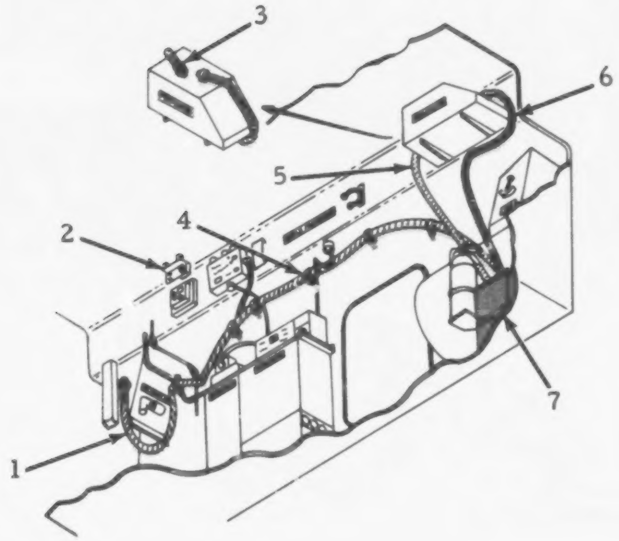
Figure 2-42. Gas-particulate filter unit layout diagram.



1. Clamp and boss assembly (7 places)
2. Hose assembly - operator's
3. Hose assembly - passenger's
4. Circuit breaker and switch assembly
5. Gripper clamp and boss installation (4 places)
6. M2A2 air purifier and frame assembly
7. Hose assembly - passenger's

TA038901

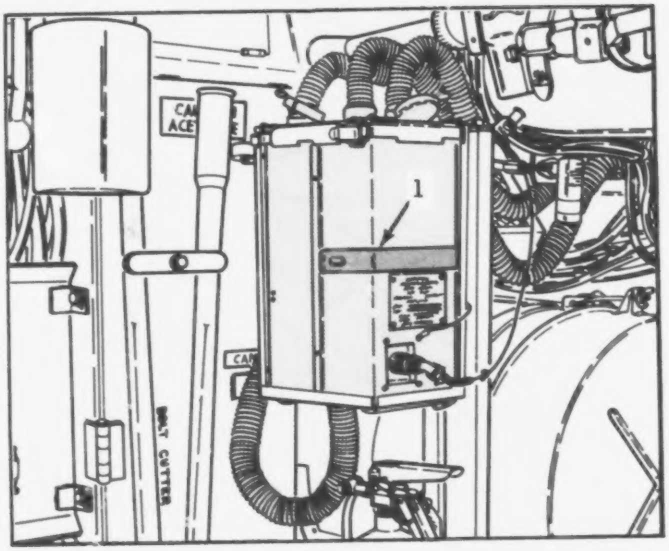
Figure 2-43. Locator view for M2A2 air purifier and equipment. (Sheet 1 of 2).



1. Hose assembly - mechanic's
2. Circuit breaker and switch assembly
3. Gripper clamp and boss assembly (3 places)
4. Clamp and boss installation (6 places)
5. Hose assembly - commander's
6. Hose assembly - rigger's
7. M2A2 air purifier and frame assembly

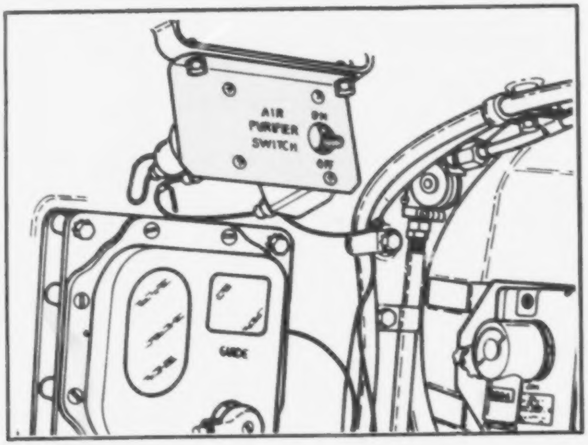
TA038902

Figure 2-43. Locator view for M2A2 air purifier and equipment (Sheet 2 of 2).


1
BOLT CUTTER

2-36. Description of Operation.

a. General. Two air purifier switches are located in the crew compartment. One is near the operator's dome light (for the left unit). The other is near the mechanic's dome light.


AIR
PURIFIER
SWITCH
ON
OFF
GAGE

TA038903

WARNING

NBC contaminated filter units must be handled using adequate precautions (FM21-40) and must be disposed of by trained personnel.

b. Gas Filter Change Requirements. The M12A1 gas filter of the M8A3 filter unit must be replaced when any one of the following conditions exists:

(1) Physical damage.

(2) Water soaked.

(3) Low airflow to the masks which is found not to be caused by clogged particulate filter, incorrect hose connections or low electrical power.

(4) 5,000 mile vehicle overhaul (peacetime operations).

(5) 10,000 hours of vehicle operation (wartime operations) no chemical agents used.

(6) 1,500 hours (approximately 5 months) of vehicle operation (wartime operations-chemical agents used).

(7) After each CK attack (as soon as possible).

(8) At beginning of combat conditions and when the use of CK is expected.

c. Particulate Filter Change Requirements. Change the M13 particulate filter whenever any of the following conditions exist:

(1) Physical damage.

(2) The M12A1 gas filter is changed.

(3) The particulate filter becomes clogged, resulting in not enough airflow to each crew member station.

d. Spring Clip Replacement.

(1) Missing or damaged.

(2) Rubber gasket missing or does not seal properly.

e . Airflow Control Cap Replacement.

(1) Missing or damaged.

(2) Cracked.

NOTE

Install new cap by disconnecting air hose and stretching center ring of cap over the hose outlet on the M12A1 filter unit.

2-37. Operation.

a . Before-Operation Services. Perform before-operation services found in table 3-1 before you operate the unit.

b . Daily Checks for Operation.

(1) If the unit will not start, check the ground cable and cable connections. Hand tighten the receptacles at the filter units, switch assembly boxes and dome lights.

(2) When the unit fails to operate properly or if you hear unusual noises, notify organizational maintenance.

(3) Wipe the housing with a damp cloth and replace the spring clip over the holes when you are done using the unit. Check it for damaged or missing parts.

c . Starting.

(1) Check MASTER switch for ON.

(2) Put on masks and adjust the facepiece.

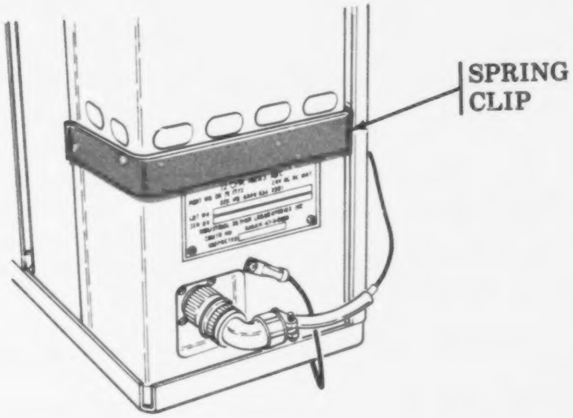
(3) Move the spring clip down to open the air inlet holes.

(4) Turn the units ON.

(5) Attach hoses from the purifier unit outlets to the masks.

NOTE

Masks will only be worn inside the vehicle.



d. Stopping.

(1) Uncouple hoses from the masks.

(2) Turn the units OFF.

(3) Remove masks.

(4) Stow masks and hoses.

(5) Move the spring clip up to cover the holes.

2-38. Maintenance Instructions.

a. General. The vehicle operator is responsible for maintaining the filter units to be sure that they function at all times.

b. Operational Services. Refer to the Preventive Maintenance Checks and Services, table 3-1, for all before-, during- and after-operation services. These checks will be done each day the vehicle is used.

TA171276

Section VII. OPERATION UNDER UNUSUAL CONDITIONS

2-39. General.

a. This section contains information for operating the M88A1 under unusual weather and terrain conditions. Instructions on special care for equipment and fording operations are provided.

b. Information found in TM 21-306, Manual for the Tracked Combat Vehicle Driver, is important to you. Study it to improve your ability as a driver.

c. Refer to the following for maintenance under unusual conditions before you operate the vehicle:

(1) Table 3-1 for Preventive-Maintenance Checks and Services.

(2) Chapter 3, section XII for maintenance under unusual conditions.

(3) LO 9-2350-256-12 for lubrication instructions.

(4) TM 9-6140-200-12 for battery care.

d. When equipment fails because of exposure to extreme conditions refer to table 3-2, troubleshooting, and notify organizational maintenance.

2-40. Extreme Cold Weather Conditions.

a. Extreme cold weather causes oil to thicken, insulation to crack, materials to become brittle and break, and batteries to freeze. Because of these and other problems the vehicle will be more difficult to operate.

b. Armament used in extreme cold weather operations must be properly lubricated. Vision devices must not be moved suddenly from warm to cold or cold to warm areas. Condensation may cause clouding of lenses and rusting of internal parts. Do not breathe on lenses.

c. Refer to and study the information in FM 31-70, FM 31-71, FM 31-72, and TM 9-207. This information is necessary for effective operation of the vehicle during cold weather.

2-41. Extreme Cold Weather Operation (+32° to -25°F)?.

a. Starting and Warmup Procedures. See figure 2-44 for main engine starting instructions.

WARNING

The use of ETHER as a starting aid is prohibited. The use of ether as a starting aid produces extremely high firing pressures which may cause serious engine damage, such as broken pistons and/or piston rings, bent connecting rods, or cylinder mounting stud failure.

CAUTION

Before moving out, drive slowly for 100 yards to warm up the suspension lubricants.

(1) Constantly watch the gages for unusual readings. Stop the vehicle if problems are noted and troubleshoot (table 3-2).

(2) Refer to TM 21-306 for instructions on driving through snow, ice, and unusual terrain.

b. At Halt or Park (P).

(1) Park the vehicle in a sheltered area if halted for a short shut down period. If no shelter is available, have the vehicle face the wind. For long shutdown periods, park on high, dry ground or on planks or brush. This prevents the tracks from freezing to the ground. Chock in place if necessary.

(2) When shutting down, place control levers in neutral so they won't freeze in an engaged position.

(3) Clean vehicle of snow, ice, and mud immediately. Perform all after-operation procedures in table 3-1. Cover the vehicle with canvas tarpaulins to protect it from snow. Keep the ends of the cover up to keep them from freezing to the ground.

(4) Protect the batteries from freezing.

(5) Refuel the vehicle immediately after operation to reduce condensation in the tanks. Use DIESEL FUEL only.

c. Armament. Cover the machinegun when not in use. Refer to TM 9-1005-213-10 for maintenance of the machinegun in cold weather.

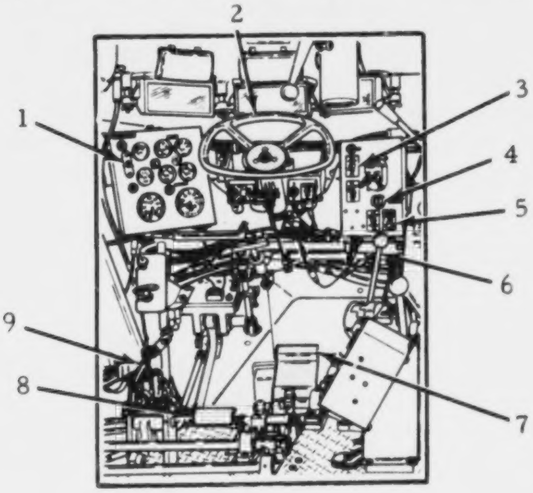
CAUTION

Turn off radio and electrical switches before starting or stopping the engine.

1. Shift transmission (6) to P. Depress brake (8) to lock it. Make sure the steering wheel (2) is centered and locked.

NOTE

Be sure the fuel tank FUEL CONTROL VALVES are properly positioned (fig. 2-8, Sheet 17 and 18).



2. Turn MASTER switch (3) ON. Check FUEL PUMP switch (5) for ON.

NOTE

When MASTER switch is ON the master and mechanical transmission warning lights will stay on until the engine is running. If lights do not come on, troubleshoot (table 3-2).

3. Move fuel selector switch (1) up and down to check fuel levels.

TA038906

Figure 2-44. Starting the main engine-cold weather (Sheet 1 of 3).

4. Operate purge pump (9) until back pressure is felt, 3 to 4 strokes should do it.

5. Depress accelerator pedal (7) 2/3 to 3/4 down and push START button (4).

6. With START button depressed, operate purge pump again and depress manifold heater switch (10). When engine starts, stop pumping and release switch (10) and START button. Back off accelerator pedal to prevent the engine from racing.

NOTE

If engine fails to crank, troubleshoot (table 3-2).

CAUTION

If engine fails to start after pushing START button for 60 seconds, stop cranking, turn off master switch and wait 3 to 5 minutes. Repeat starting procedures, if engine doesn't start on third try, troubleshoot (table 3-2).

7. If engine fails to start due to low batteries, start the APU (fig.2-45) to charge batteries or slave start the vehicle (fig. 2-13).

8. Keep engine speed at 1,000 to 1,200 rpm until engine runs smoothly.

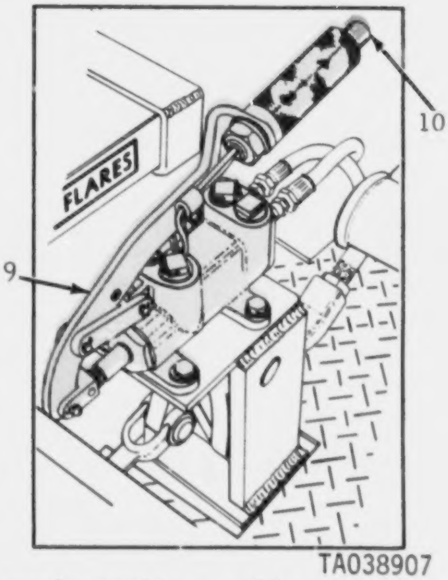


Figure 2-44. Starting the main engine - cold weather (Sheet 2 of 3).

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9. If the engine runs rough after you have started it, do the following:

   a. Hold brake and shift the transmission to NEUTRAL (N).

   b. Push the START button.

   c. Push in the manifold heater switch (10) on the purge pump.

   d. Pump until engine runs smoothly.

   e. If engine will not smooth out after several attempts at pumping, notify organizational maintenance.

10. Check generator blower operation (fig. 2-11, step 8).

11. Check engine operation (fig. 2-12).

TA038908

Figure 2-44. Starting the main engine - cold weather (Sheet 3 of 3).

d. Starting the Auxiliary Power Unit. Before you start the APU in extremely cold weather (0° to -25°F) refer to LO 9-2350-256-12 for the following:

(1) Engine crankcase oil grade and level.

(2) Chain case oil grade and level.

(3) Hydraulic oil grade and level.

See figure 2-45 for starting instructions.

2-42. Extreme Hot Weather Conditions.

a. General. The vehicle may overheat during long, hard towing operations in high gear or when driving at high speeds. Check temperature gages and warning lights often. Stop vehicle to cool it off whenever practical. Keep ventilating blower on during operation. Inspect the air cleaners and oil coolers often. Clean off dust, insects, or debris from the oil coolers by brushing off screens or flushing with low pressure water. Add tropical electrolyte to batteries (TM 9-6140-200-12).

b. At Halt or Park.

(1) Don't park the vehicle in the sun for a long time. Protect it from the sun, sand and dust.

(2) If you can't find shelter for parking, cover the vehicle with canvas. Be sure to protect the periscopes, vision blocks and engine compartment from sand.

(3) Check the vehicle often for rust and fungus when it is shutdown for a long time in hot, humid weather. Clean and lubricate any areas where this is evident.

c. Vision Devices. Check the periscopes for fungus growth on the lenses and clean if any is present. If paint is chipped, touch up immediately to prevent rusting.

CAUTION

Never let the M24 periscope be exposed to direct sunlight. Keep periscope in box during daytime operation.

TA038909

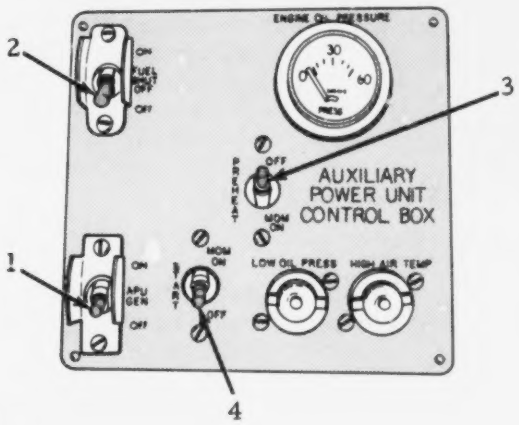
When starting the APU in extremely cold weather (0° to -25°F), do the following:

1. Check with the unit maintenance officer to see that the APU has been properly serviced for cold weather operation.

2. Turn MASTER switch ON and FUEL PUMP switch OFF.

3. Set the hydraulic SYSTEM SELECTOR control lever on MAIN and the hydraulic POWER control lever OFF (fig. 2-5, Sheets 9 and 10).

4. Check the APU generator switch (1) for OFF.


2
3
1
4
ENGINE OIL PRESSURE
30
0
60
PRESS
ON
FUEL SHUT OFF
OFF
PREHEAT
OFF
MOM ON
AUXILIARY POWER UNIT CONTROL BOX
ON
APU GEN
OFF
START
MOM ON
OFF
LOW OIL PRESS
HIGH AIR TEMP

5. To start the APU:

NOTE

PREHEAT switch (3) is held ON until engine starts.

   a. FUEL SHUTOFF switch (2) - ON.

   b. PREHEAT - ON for 120 seconds.

   c. START (4) - ON until engine runs or for 60 seconds. If engine does not start, continue with step d.

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Figure 2-45. Starting the auxiliary power unit in extremely cold weather (Sheet 1 of 2).

d. PREHEAT - ON for 60 seconds.

e. START - ON until engine runs (no longer than 60 seconds).

CAUTION

1. Do not crank engine for longer than 1 minute at a time.
2. Do not attempt to start the APU for longer than 5 minutes. If it doesn't start, notify organizational maintenance.

6. If APU is properly serviced, it should start. If it doesn't, repeat procedures and try again. Troubleshoot if engine fails to turn over on second try (table 3-2).

7. To stop the APU, turn the FUEL SHUTOFF switch (2) OFF.

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Figure 2-45. Starting the auxiliary power unit in extremely cold weather (Sheet 2 of 2).

2-43. Operation on Unusual Terrain.

a. Mud. Use 1st gear when driving through mud to prevent digging in. If you become stuck, get towed out. When it's going to get cold, park on solid ground or footing and clean the tracks and wheels.

b. Snow. You can drive over heavily crusted snow. If the vehicle breaks through the crust, shift into 1st gear and drive slowly to get back on top. Go up grades as straight as possible and avoid sharp turns. When snow is soft or fine, drive cautiously.

c. Ice. Drive carefully and steadily on ice. If you start to skid, let off the accelerator. Move out slowly.

d. Sand. Be careful not to spin the tracks. If you do, slow down and use the proper gear to move steadily. Don't let the engine labor for too long. It might overheat. When you travel in soft sand do not make sharp turns in 1st gear. The tracks will be thrown because of sand building up in the suspension system. Wide turns should be made in 2nd or 3rd gear.

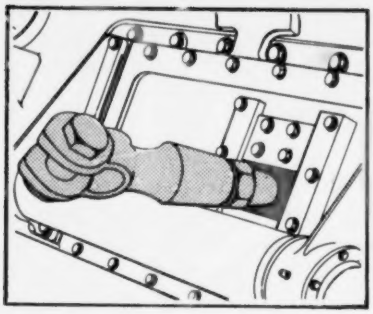
e. Dust. Check the air cleaner restriction gage located directly above air cleaners and clean the filter if necessary. See para 3-32 through 3-34 for instructions.

2-44. Fording Operation.

a. General. You may have to drive the vehicle into water during operations. The depth may be from a few inches to a few feet. Normal fording (without extra equipment) is allowable up to 56 inches. Perform the following when fording:

b. Before Fording.

(1) Reel in the main winch cable until light pressure is applied between the clevis and the opening to reduce the entrance of water.



(2) The engine must be in top shape. Make certain the hull drain valves are closed. Check drain valve lever (fig. 2-5, Sheet 2).

NOTE

Make sure the brake inspection plates in the rear under the vehicle are tight with all bolts present.

(3) Do not go in water over 56 inches deep for normal fording.

NOTE

No water should spill into the engine compartment at this depth.

c. Fording.

(1) Shift into 1st gear and speed up engine to prevent stalling when cold water hits it. Keep engine speed above 950 rpm.

(2) Enter water slowly.

(3) Keep engine above 950 rpm. Drive 3 to 4 mph to prevent making a bow wave.

(4) If you completely submerge the vehicle to a point where water enters the engine compartment, keep engine speed up to prevent water from entering the engine. Move the vehicle out of the water immediately and drain the engine compartment by operating the drain valve lever (fig. 2-5, sheet 2). If

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the engine stalls while completely submerged, have vehicle towed out. Apply temporary preservation as outlined in LO 9-2350-256-12. Send it to organizational maintenance as soon as possible for permanent maintenance.

d. If you have to stop while the engine is under water, brake the vehicle and shift to N. Keep the engine at 950 to 1,000 rpm. To move again, shift to 1st and go forward slowly at 3 to 4 mph. Keep engine speed above 950 rpm.

e. Deep Water Fording. Refer to paragraphs 4-6 through 4-11 for deep water fording kit description and operating instructions.

f. After-fording Operations.

(1) Open drain valves (fig. 2-5, sheet 2). Check engine oil level for presence of water. If change of oil color or excessive water is noted, drain oil and refill. Run the engine for a few minutes to help evaporate and blow out any water that might have entered.

(2) Refer to paragraph 3-43 and 3-44 for maintenance operations of vehicle and armament. Wipe dry any wet vision devices and turn them in for reconditioning as soon as possible.

CHAPTER 3

MAINTENANCE INSTRUCTIONS

Section I. GENERAL

3-1. Purpose and Content.

a. Purpose. This chapter provides the information which you will need to maintain and repair the M88A1. If a problem arises that is above your level of work, notify organizational maintenance.

b. Content. An index is provided to show what is contained in this chapter and where it is located.

Index for Maintenance Instructions

Item	Para.
Air cleaner maintenance	3-22
Caliber .50 machinegun and mount maintenance	3-26
Light maintenance - instrument, dome and blackout marker	3-28
Linkage flush tubes	3-9f
Lubrication	3-6
Maintenance under unusual conditions	3-38
Painting	3-7
Preventive maintenance checks and services	3-8
Tools and equipment	3-2
Track maintenance	3-14
Troubleshooting	3-12
Vision device maintenance	3-19
Welding equipment maintenance	3-35

Section II. TOOLS AND EQUIPMENT

3-2. General.

a. Tools and equipment necessary for general maintenance procedures are supplied with the vehicle. Repair parts and other equipment will be issued when authorized.

b. Supplies that you need to take care of your vehicle are listed in Appendix C. These supplies are items that you normally will use up or wear out when you use them. Maintenance supplies work for you. Try to get the most out of them.

3-3. Repair Parts.

Repair parts will be supplied and issued to replace worn, broken or unserviceable parts. This only includes the parts needed for repairs that are within your level of maintenance. These parts are listed in appendix B which is the authority for ordering replacements.

3-4. Common Tools and Equipment.

Standard and commonly used tools and equipment which have a general use on the vehicle are authorized for issue by tables of organization and equipment.

3-5. Special Tools and Equipment.

Special tools and equipment needed for operation, maintenance, repair and general use are listed in appendix B which is the authority for ordering replacements.

TA171590

Section III. LUBRICATION AND PAINTING

3-6. Lubrication Order.

Refer to LO 9-2350-256-12 for all lubrication information and procedures.

3-7. Painting.

Refer to TM 9-213 for painting information and procedures.

Section IV. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

3-8. General.

a. Maintenance Forms and Records

Every mission begins and ends with the paperwork. There isn't much of it, but you have to keep it up. The forms and records you fill out have several uses. They are a permanent record of the services, repairs, and modifications made on your vehicle. They are reports to organizational maintenance and to your commander. And they are a checklist for you when you want to know what is wrong with the vehicle after its last use, and whether those faults have been fixed. For the information you need on forms and records, see TM 38-750.

b. Preventive Maintenance Checks and Services

(l) Do your before (B) PREVENTIVE MAINTENANCE just before you operate the M88Al. Pay attention to the CAUTIONS and WARNINGS.

(2) Do your during (D) PREVENTIVE MAINTENANCE during operation. (During operation means to monitor the M88A1 and its related components, e.g., engine, APU, while they are actually being operated.

(3) Do your after (A) PREVENTIVE MAINTENANCE right after operating the M88A1. Pay attention to the CAUTIONS and WARNINGS.

(4) Do your (W) PREVENTIVE MAINTENANCE weekly.

(5) Do your (M) PREVENTIVE MAINTENANCE once a month.

(6) If something doesn't work, troubleshoot it with the instructions in this manual and notify your supervisor.

(7) Always do your PREVENTIVE MAINTENANCE in the same order so it gets to be a habit. Once you've had some practice, you'll spot anything wrong in a hurry.

(8) If anything looks wrong and you can't fix it, write it on your DA Form 2404. If you find something seriously wrong, report it to organizational maintenance RIGHT NOW.

(9) When you do your PREVENTIVE MAINTENANCE, take along the tools you need to make all the checks. You always need a rag or two.

A—Keep it clean: Dirt, grease, oil, and debris only get in the way and may cover up a serious problem. Clean as you work and as needed. Use dry cleaning solvent (SD-2) on all metal surfaces. Use soap and water when you clean rubber or plastic material.

WARNING

Dry cleaning solvent, used to clean parts is potentially dangerous to personnel and property. Do not use open flame or excessive heat. Flash point of solvent is: 138°F.

B -Bolts, nuts, and screws: Check them all for obvious looseness, missing, bent or broken condition. You can't try them all with a tool, of course, but look for chipped paint, bare metal, or rust around bolt heads. If you find one you think is loose, tighten it, or report to organizational maintenance if you can't tighten it.

C—Welds: Look for loose or chipped paint, rust or gaps where parts are welded together. If you find a bad weld, report it to organizational maintenance.

D—Electric wires and connectors: Look for cracked or broken insulation, bare wires, and loose or broken connectors. Tighten loose connectors and make sure the wires are in good shape.

E—Hoses and fluid lines: Look for wear, damage, and leaks, and make sure clamps and fittings are tight. Wet spots show leaks, of course. But a stain around a fitting or connector can mean a leak. If a leak comes from a loose fitting or connector, tighten it. If something is broken or worn out, report it to organizational maintenance.

(10) It is necessary for you to know how fluid leakage affects the status of your vehicle. The following are definitions of the types/classes of leakage you need to know to be able to determine the status of your vehicle. Learn, then be familiar with them and REMEMBER -WHEN IN DOUBT, NOTIFY YOUR SUPERVISOR!

Leakage Definitions for Crew/Operator PMCS

CLASS I	Seepage of fluid (as indicated by wetness or discoloration) not great enough to form drops.
CLASS II	Leakage of fluid great enough to form drops but not enough to cause drops to drip from item being checked/inspected.
CLASS III	Leakage of fluid great enough to form drops that fall from the item being checked/inspected.

CAUTION

EQUIPMENT OPERATION IS ALLOWABLE WITH MINOR LEAKAGES (CLASS I OR II). OF COURSE, CONSIDERATION MUST BE GIVEN TO THE FLUID CAPACITY IN THE ITEM/SYSTEM BEING CHECKED/INSPECTED. WHEN IN DOUBT, NOTIFY YOUR SUPERVISOR.

WHEN OPERATING WITH CLASS I OR II LEAKS, CONTINUE TO CHECK FLUID LEVELS AS REQUIRED IN YOUR PMCS.

CLASS III LEAKS SHOULD BE REPORTED TO YOUR SUPERVISOR OR TO ORGANIZATIONAL MAINTENANCE FOR CORRECTIVE ACTION.

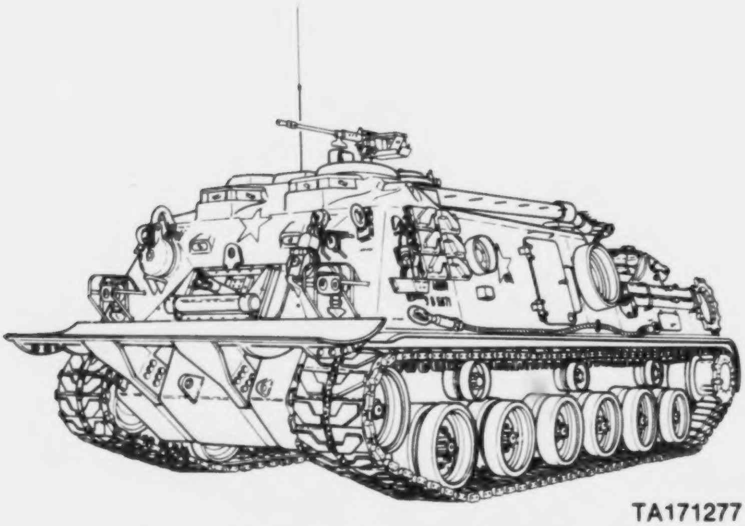

Table 3-1. PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Continued

NOTE: Within designated interval, these checks are to be performed in order listed

B-Before	A-After
D-During	W-Weekly
M-Monthly	

Item No.	Interval					Item to be Inspected	Procedures-Check for and have repaired or adjusted as necessary	Equipment is not ready Not Ready/Available If:
	B	D	A	W	M			
							WARNING NBC contaminated filters must be handled using adequate precautions (FM21-40) and must be disposed of by trained personnel. NOTE Perform weekly as well as before PMCS's if:	

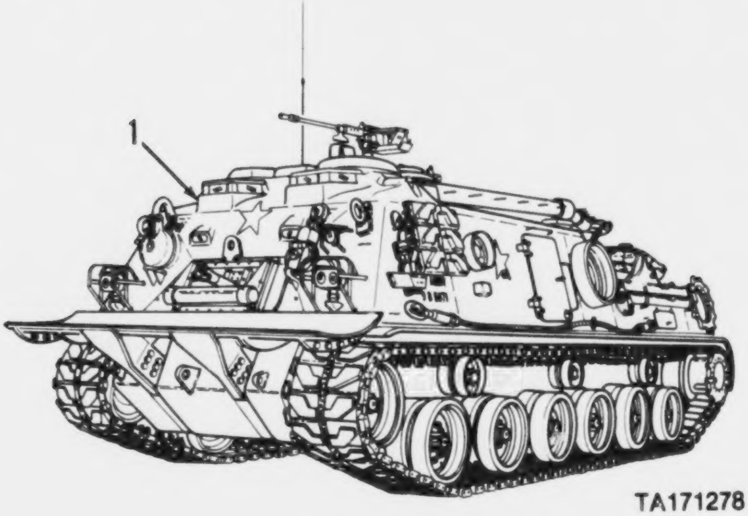

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Table 3-1. PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Continued

NOTE: Within designated interval, these checks are to be performed in order listed

B-Before A-After

D-During W-Weekly

M-Monthly

Item No.	Interval					Item to be Inspected	Procedures—Check for and have repaired or adjusted as necessary	Equipment is Not Ready/ Available If:
	B	D	A	W	M			
1						Exterior	A. You are the driver but have not operated the vehicle since the last weekly. B. You are operating the vehicle for the first time. NOTE Make the following walk around checks. Visually check vehicle for security of mounting and damage.	

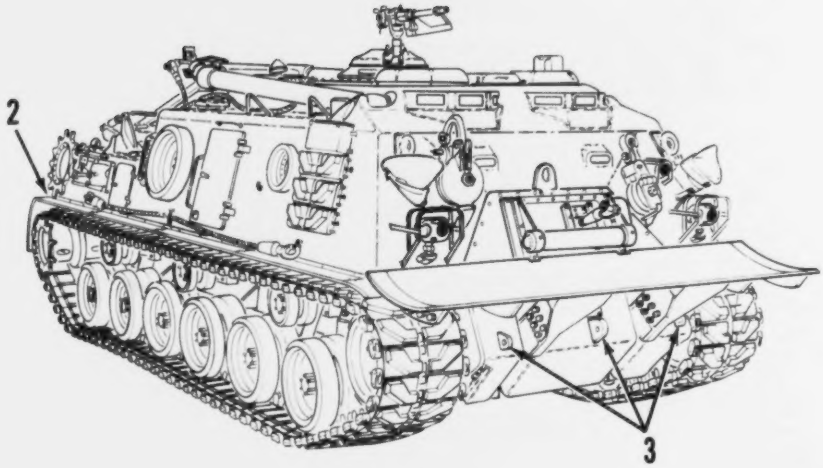


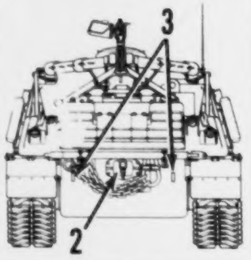
Table 3-1. PREVENTIVE MAINTENANCE CHECKS AND SERVICES-Continued

NOTE: Within designated interval, these checks are to be performed in order listed.

B-Before A-After

D-During W-Weekly

M-Monthly

Item No.	Interval					Item to be Inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment is Not Ready/ Available If:
	B	D	A	W	M			
	X						A. Towing pintle (2)	
	X						B. Towing eyes and lugs (3) 	

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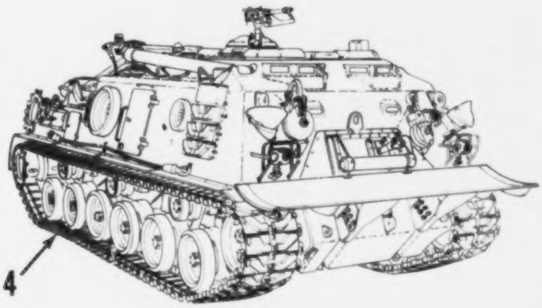


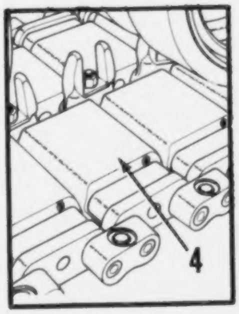
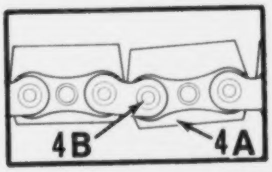
Table 3-1. PREVENTIVE MAINTENANCE CHECKS AND SERVICES-Continued

NOTE: Within designated interval, these checks are to be performed in order listed.

B-Before A-After

D-During W-Weekly

M-Monthly

Item No.	Interval					Item to be Inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment is Not Ready/ Available If:
	B	D	A	W	M			
	X						C. Check under vehicle for evidence of fluid (fuel, oil) leakage.	Any Class III fuel leaks or oil leaks.
	X						D. Tracks (4)  	Any broken shoes or pins. One or more missing wedges or missing center guide or end connector. Three or more dead shoes (4A) on any one track side. NOTE When track shoe (4A) appears out of line, it indicates a dead shoe or damaged track pin bushing (4B). 

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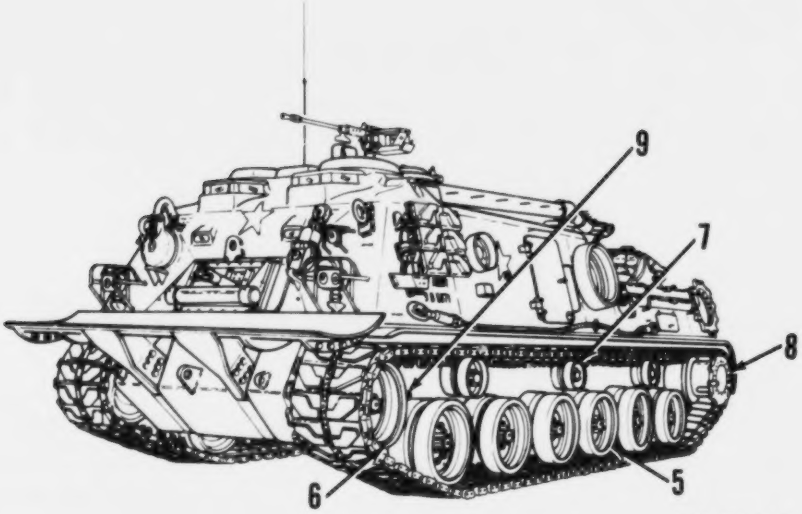


Table 3-1. PREVENTIVE MAINTENANCE CHECKS AND SERVICES-Continued

NOTE: Within designated interval, these checks are to be performed in order listed.

B-Before
A-After
D-During
W-Weekly
M-Monthly

Item No.	Interval					Item to be Inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment is Not Ready/ Available If:
	B	D	A	W	M			
	X						E. Track sag which causes the track to dip to the support roller hub centerline midway between two consecutive support rollers.	
	X						F. Roadwheels (5), compensating idler wheels (6), support rollers (7), and sprockets (8).	One or more roadwheels, compensating idler wheels or support rollers missing or unserviceable. Elongated mounting holes. Rubber separation and or chunking equals half the original contact area around entire wheel.

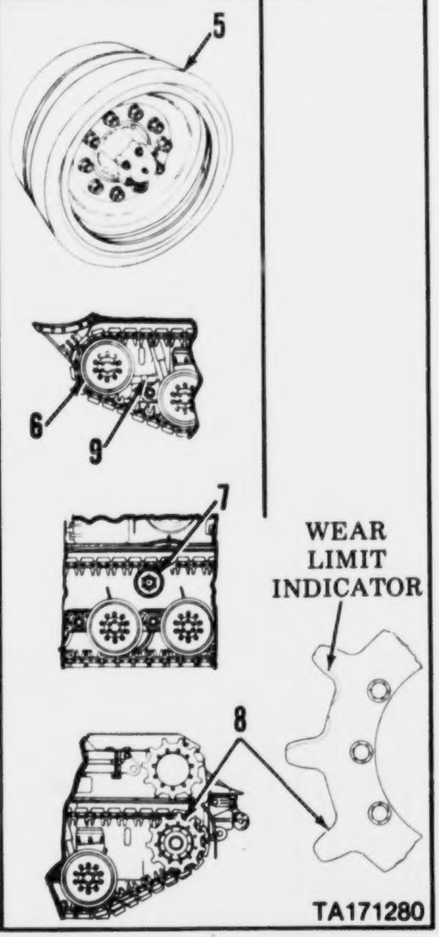
Table 3-1. PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Continued

NOTE: Within designated interval, these checks are to be performed in order listed

B-Before A-After

D-During W-Weekly

M-Monthly

Item No.	Interval					Item to be Inspected	Procedures — Check for and have repaired or adjusted as necessary	Equipment is Not Ready/ Available If:
	B	D	A	W	M			
								

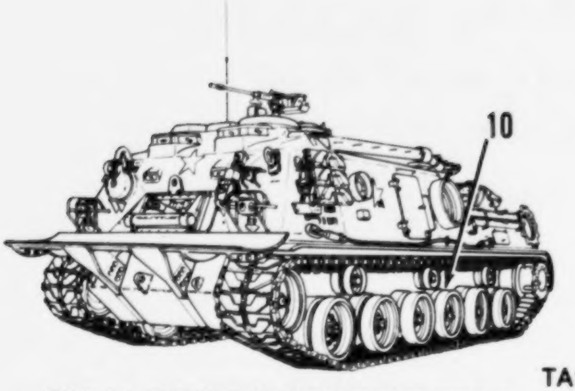


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Table 3-1. PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Continued

NOTE: Within designated interval, these checks are to be performed in order listed

B-Before A-After

D-During W-Weekly

M-Monthly

Item No.	Interval					Item to be Inspected	Procedures — Check for and have repaired or adjusted as necessary	Equipment is Not Ready/ Available If:
	B	D	A	W	M			
				X			G. Drive sprockets (8)	Wear limit indicator no longer visible.
	X						H. Track adjusting links (9)	One or more track adjusting links missing or unserviceable.
	X						I. Roadwheel arms (10)	Roadwheel arms bent, broken, or missing.
2	X					Torsion Bars	A. On roadwheels 1 and 6, check for broken torsion bars by observing abnormal sagging of any corner of the vehicle, abnormal position of the roadwheel and the abnormal position of track. Check for a broken torsion bar by attempting to pry up roadwheel using crowbar.	Torsion bars for roadwheels 1 and 6 brcken or missing.

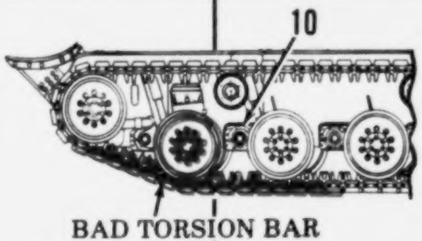
Table 3-1. PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Continued

NOTE: Within designated interval, these checks are to be performed in order listed

B-Before A-After

D-During W-Weekly

M-Monthly

Item No.	Interval					Item to be Inspected	Procedures—Check for and have repaired or adjusted as necessary	Equipment is Not Ready/ Available If:
	B	D	A	W	M			
	X						 **WARNING** Be careful when you feel roadwheel, idler track support roller hubs and shock absorbers, they can heat up enough to burn you. B. Check for broken torsion bars by attempting to pry up roadwheels 2 thru 5 using crowbar.	
3		X	X			Temperatures of roadwheel, idler, and support roller hubs and shock absorbers	At halts other than tactical operations and immediately after vehicle operation, feel these components cautiously for noticeable variation in temperature between like components. An overheated hub indicates maladjustments, inadequate lubrication or bearings. If shock absorbers (11) are defective, they will be colder than the hull.	Any hubs found to be over-heated and temperature cannot be corrected by lubrication. TA171282

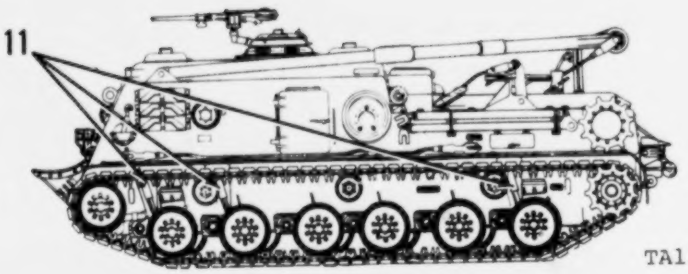


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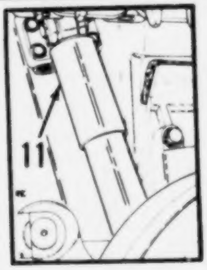
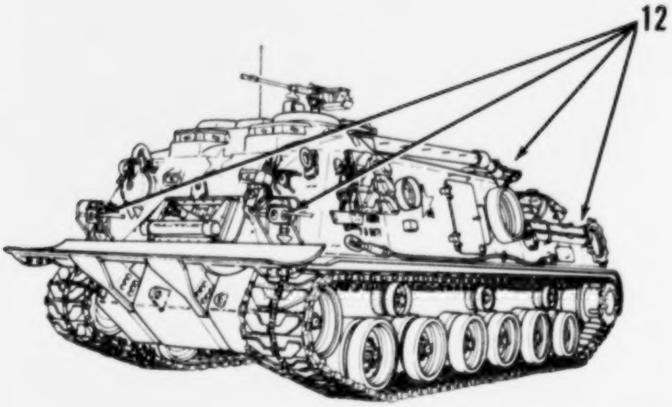
Table 3-1. PREVENTIVE MAINTENANCE CHECKS AND SERVICES-Continued

NOTE: Within designated interval, these checks are to be performed in order listed.

B-Before
D-During
A-After
W-Weekly
M-Monthly

Item No.	Interval					Item to be Inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment is Not Ready/ Available If:
	B	D	A	W	M			
								
4				X		Hull Access Plates	Be sure that all hull access plates are present and secure using 9/16 in. socket, 7 in. extension, and hinge handle.	
5		X				Personnel side door and top hatches	A. Operate side doors and top hatches to be sure they lock securely in open and closed positions.	
					X		B. Visually check for loose or damaged crash pads and door seals.	



TA125561

Table 3-1. PREVENTIVE MAINTENANCE CHECKS AND SERVICES-Continued

NOTE: Within designated interval, these checks are to be performed in order listed.

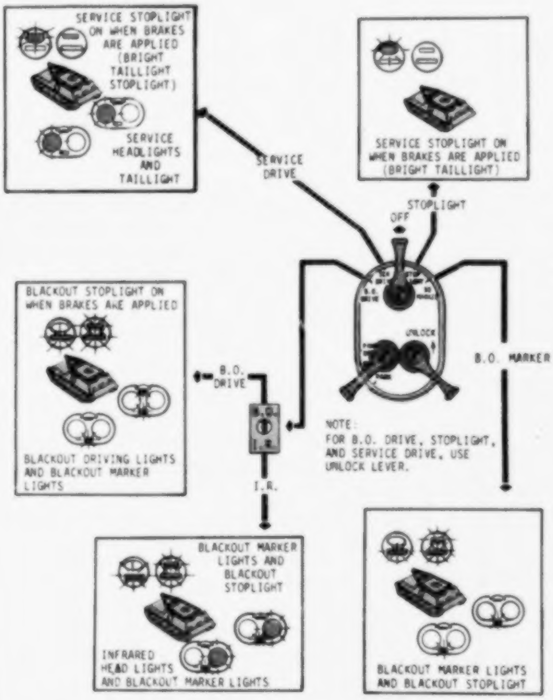
B-Before
D-During
M-Monthly
A-After
W-Weekly

Item No.	Interval					Item to be Inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment is Not Ready/ Available If:
	B	D	A	W	M			
6	X					Lights	WARNING Do not look directly into infrared lights while checking for operation. Check operation of lights (12). To check infrared lights, turn on and place hand on lens. Heat will be felt if light is operating.	

Table 3-1. PREVENTIVE MAINTENANCE CHECKS AND SERVICES-Continued

NOTE: Within designated interval, these checks are to be performed in order listed.

B-Before
D-During
A-After
W-Weekly
M-Monthly

Item No.	Interval					Item to be Inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment is Not Ready/ Available If:
	B	D	A	W	M			
								

SERVICE STOPLIGHT ON WHEN BRAKES ARE APPLIED (BRIGHT TAILLIGHT STOPLIGHT)
SERVICE HEADLIGHTS AND TAILLIGHT
SERVICE DRIVE
SERVICE STOPLIGHT ON WHEN BRAKES ARE APPLIED (BRIGHT TAILLIGHT)
STOPLIGHT
OFF
UNLOCK
B.O. MARKER
BLACKOUT STOPLIGHT ON WHEN BRAKES AKE APPLIED
BLACKOUT DRIVING LIGHTS AND BLACKOUT MARKER LIGHTS
B.O. DRIVE
B.O.
I.R.
BLACKOUT MARKER LIGHTS AND BLACKOUT STOPLIGHT
INFRARED HEAD LIGHTS AND BLACKOUT MARKER LIGHTS
BLACKOUT MARKER LIGHTS AND BLACKOUT STOPLIGHT

NOTE:
FOR B.O. DRIVE, STOPLIGHT, AND SERVICE DRIVE, USE UNLOCK LEVER.

TA125562

Table 3-1. PREVENTIVE MAINTENANCE CHECKS AND SERVICES-Continued

NOTE: Within designated interval, these checks are to be performed in order listed.

B-Before A-After
D-During W-Weekly
M-Monthly

Item No.	Interval					Item to be Inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment is Not Ready/ Available If:
	B	D	A	W	M			
7		X				Main Hydraulic System, Boom Hoist, Winch Assembly, and Main Winch	A. Engage main hydraulic system to determine operation of controls, pumps, and hydraulic governor.	Hydraulic system inoperative. Improper performance or function, class III oil leaks; winch or boom inoperative, one or more items missing or unserviceable
		X					B. During operation, check for any unusual noise or vibration.	
							C. Inspect all hoses and connections for leaks, ruptures or other damaged conditions.	
		X					D. During operations, determine function of winch, winch controls and hydraulic motor.	
				X			E. Visually inspect boom travel support for operation and condition.	
				X			F. Visually inspect boom, A-frame, stayline cables, rollers, cylinders, boom control levers and sheaves for presence and condition.	
					X		G. Unwind cable and inspect for kinks, breaks, frayed condition, and proper wind on drum.	Any cable with kinks, breaks, frayed condition or missing.

Table 3-1. PREVENTIVE MAINTENANCE CHECKS AND SERVICES-Continued

NOTE Within designated interval, these checks are to be performed in order listed.

B-Before A-After
D-During W-Weekly
M-Monthly

Item No.	Interval					Item to be Inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment is Not Ready/ Available If:
	B	D	A	W	M			
8		X				Spade	A. Raise and lower spade to determine function and to detect binding at pivot points.	
		X					B. Operate spade release handle to determine locking function.	Spade will not lock in raised position.
9				X		Batteries	A. Check electrolyte level. Electrolyte level should be up to split rings. CAUTION In cold weather, charge the batteries immediately after adding water so water will combine with electrolyte and not freeze. CAUTION Be careful when servicing batteries to avoid spilling or over filling. Battery acid deteriorates plastic and rubber, causing fuel lines to leak. This can result in a damaging fire. Check parts when engine deck doors are open for pock marks indicating contact with acid. Flush all metal parts with water or have them replaced as required.	

Table 3-1 PREVENTIVE MAINTENANCE CHECKS AND SERVICES-Continued

NOTE: Within designated interval, these checks are to be performed in order listed.

B-Before
D-During
A-After
W-Weekly
M-Monthly

Item No	Interval					Item to be Inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment is Not Ready/ Available If:
	B	D	A	W	M			
					X		B. Inspect terminals and cables for corrosion and tightness (TM 9-6140-200-14). Check for loose battery holddown brackets. Remove corrosion from batteries and terminal lugs. Coat with grease type GAA.	
10	X					Engine Oil Level (Engine Running)	Engine oil level check engine and transmission oil lubricant levels. Refer to LO 9-2350-256-12. Add oil as necessary.	
10.1	X					Engine Oil Level (Engine Running)	A. Set parking brake and shift lever in park position, start engine. Run engine at 1000 to 1200 rpm for five or six minutes (or until engine temperature gage reads between 140° 240°F). Reduce engine idle to 675 to 725 rpm.	
	X						B. Remove gage rod (dipstick) from tube, wipe rod. Reinsert gage rod and remove. Add oil as required to bring level up to FULL mark on rod.	

Table 3-1. PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Continued

NOTE: Within designated interval, these checks are to be performed in order listed

B-Before A-After

D-During W-Weekly

M-Monthly

Item No.	Interval					Item to be Inspected	Procedures— Check for and have repaired or adjusted as necessary	Equipment is Not Ready/ Available If:
	B	D	A	W	M			
11			X			Transmission Oil Level (Engine Running)	A. Set parking brake and with shift lever in park position, start engine. Run engine at 1000 to 1200 rpm for five or six minutes (or until transmission temperature gage reads 160°-280°F). Reduce engine idle to 675-725 rpm.	
			X				B. Remove gage rod (dipstick) from tube, wipe rod. Reinsert gage rod and remove. The oil level should be at the FULL mark or slightly above due to expansion of the oil. On new transmissions filled with preservative oil, drain after 100 miles (or 10 hours) of operation and fill with proper grade lubricant. After 500 miles of operation, drain and fill again. Thereafter, drain and fill every 1,500 miles or twice a year. Drain only when hot after operation. Refill capacity is approximately 17 gallons. (Refer to LO 9-2350-256-12).	
12	X					Engine Compartment	Check engine and transmission oil coolers for obstruction of air flow. Check area for leaks.	Class III oil leaks.

Table 3-1. PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Continued

NOTE: Within designated interval, these checks are to be performed in order listed

B-Before A-After

D-During W-Weekly

M-Monthly

Item No.	Interval					Item to be Inspected	Procedures— Check for and have repaired or adjusted as necessary	Equipment Is Not Ready/ Available If:
	B	D	A	W	M			
13						Auxiliary Power Unit	NOTE Check only when operation is required. Check auxiliary power unit oil level as follows:	
	X						A. Remove oil level indicator, wipe clean, insert, remove and check. If level is below FULL mark, add oil until level is up to mark (LO 9-2350-256-12).	
	X						B. Drain condensate from fuel filters.	
							CAUTION Severe engine damage can result if contaminated air is permitted to enter the combustion chamoer. Dirt and grit in the air mixing with oil or fuel will act the same as sandpaper, creating excessive wear on machined surfaces.	
14		X				Air Cleaners	A. Observe restriction gage (13) and when color changes to red, clean or replace filter element (14). Reset restriction gage.	

Table 3-1. PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Continued

NOTE: Within designated interval, these checks are to be performed in order listed

B-Before	A-After
D-During	W-Weekly

M-Monthly

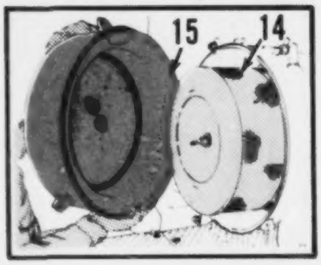
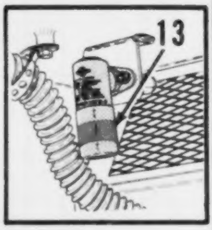
Item No.	Interval					Item to be Inspected	Procedures— Check for and have repaired or adjusted as necessary	Equipment Is Not Ready/ Available If:
	B	D	A	W	M			
			X				B. Empty dust cover (15) daily after operation.	
			X				C. Check for damaged or unserviceable components of the air cleaner system.	Any holes or tears in the air induction tubes; Any hose or missing hose clamps.
							CAUTION Do not drop or rap filter element to clean. Seals may be damaged. NOTE For desert or extremely dusty operation, clean dust cover frequently and check restriction gage often for RED mark.  	 TA171283

Table 3-1. PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Continued

NOTE: Within designated interval, these checks are to be performed in order listed

B-Before A-After

D-During W-Weekly

M-Monthly

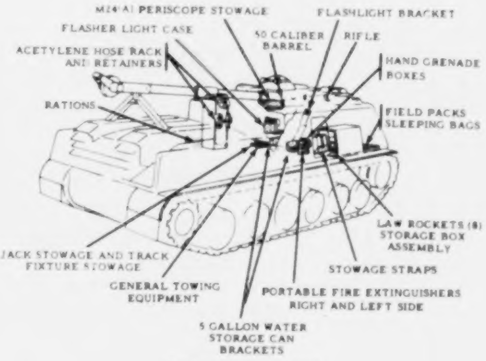
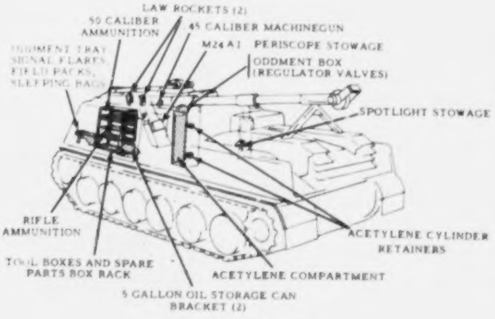
Item No.	Interval					Item to be Inspected	Procedures—Check for and have repaired or adjusted as necessary	Equipment Is Not Ready/ Available If:
	B	D	A	W	M			
15	X			X		Stowage Boxes and Stowed Equipment	Check condition of boxes and equipment (listed in Appendix B) to see if they are secure, servicable, and clear.	
							 M24A1 PERISCOPE STOWAGE FLASHLIGHT BRACKET FLASHER LIGHT CASE 50 CALIBER BARREL RIFLE ACETYLENE HOSE RACK AND RETAINERS HAND GRENADE BOXES RATIONS FIELD PACKS SLEEPING BAGS LAW ROCKETS (8) STORAGE BOX ASSEMBLY JACK STOWAGE AND TRACK FIXTURE STOWAGE STOWAGE STRAPS GENERAL TOWING EQUIPMENT PORTABLE FIRE EXTINGUISHERS RIGHT AND LEFT SIDE 5 GALLON WATER STORAGE CAN BRACKETS RIGHT REAR VIEW  LAW ROCKETS (2) 50 CALIBER AMMUNITION 45 CALIBER MACHINEGUN ODDMENT TRAY SIGNAL FLARES, FIELD PACKS, SLEEPING BAGS M24A1 PERISCOPE STOWAGE ODDMENT BOX (REGULATOR VALVES) SPOTLIGHT STOWAGE RIFLE AMMUNITION ACETYLENE CYLINDER RETAINERS TOOL BOXES AND SPARE PARTS BOX RACK ACETYLENE COMPARTMENT 5 GALLON OIL STORAGE CAN BRACKET (2) LEFT REAR VIEW	

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Table 3-1. PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Continued

NOTE: Within designated interval, these checks are to be performed in order listed

B-Before A-After

D-During W-Weekly

M-Monthly

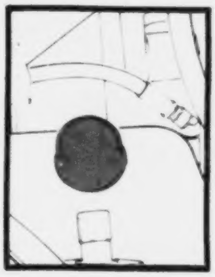
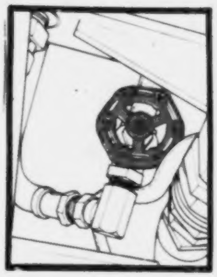
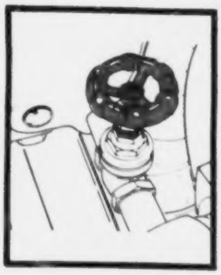
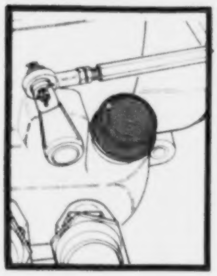
Item No.	Interval					Item to be Inspected	Procedures— Check for and have repaired or adjusted as necessary	Equipment is Not Ready/ Available If:
	B	D	A	W	M			
16	X					Oil Levels Hydraulic	Check lubricant levels (see LO 9-2350-256-12).  MAIN WINCH OIL LEVEL INDICATOR  MAIN WINCH OIL DRAIN VALVE  HOIST WINCH OIL DRAIN VALVE  HOIST WINCH OIL LEVEL INDICATOR TA171284	

Table 3-1. PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Continued

NOTE: Within designated interval, these checks are to be performed in order listed

B-Before A-After

D-During W-Weekly

M-Monthly

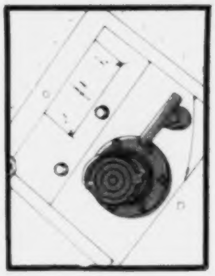
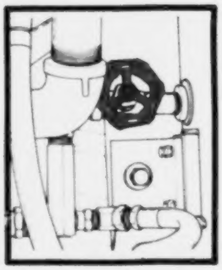
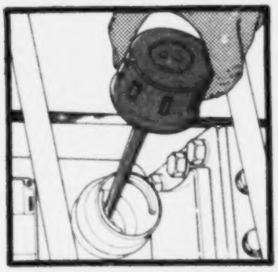
Item No.	Interval					Item to be Inspected	Procedures—Check for and have repaired or adjusted as necessary	Equipment Is Not Ready/ Available If:
	B	D	A	W	M			
							 HYDRAULIC OIL TANK LEVEL INDICATOR AND FILL  HYDRAULIC OIL TANK DRAIN VALVE  POWER PACK TRANSMISSION OIL FILLER AND LEVEL INDICATOR TA171285	

Table 3-1. PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Continued

NOTE: Within designated interval, these checks are to be performed in order listed

B-Before A-After

D-During W-Weekly

M-Monthly

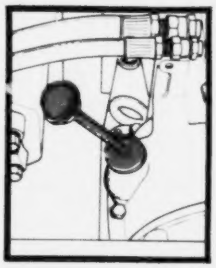
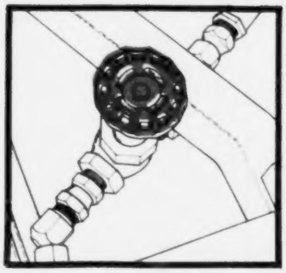
Item No.	Interval					Item to be Inspected	Procedures—Check for and have repaired or adjusted as necessary	Equipment is Not Ready/Available If:
	B	D	A	W	M			
							 MECHANICAL TRANSMISSION OIL LEVEL INDICATOR AND FILL  MECHANICAL TRANSMISSION OIL DRAIN VALVE TA171286	

Table 3-1. PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Continued

NOTE: Within designated interval, these checks are to be performed in order listed

B-Before A-After

D-During W-Weekly

M-Monthly

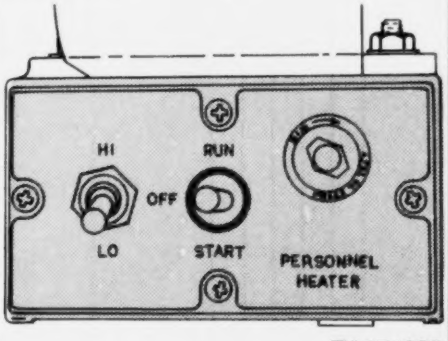
Item No.	Interval					Item to be Inspected	Procedures—Check for and have repaired or adjusted as necessary	Equipment is Not Ready/ Available if:
	B	D	A	W	M			
17	X					Fire Extinguishers(Fixed or Portable)	A. Inspect pins, heads, connecting tubes and controls for broken seals, tightness and for serviceable condition. Check pins, missing cylinder heads and connecting tubes for looseness, cracking or evidence of damage.	Seal broken or missing. Any fixed or portable fire extinguisher cylinder missing.
					X		B. Check inspection tags for current inspection of cylinders.	
18		X				Personnel Heater	NOTE Check only when operation is required.	
		X					A. Check for proper operation.	
							B. Inspect for fuel and exhaust leaks.	Any fuel leaks.
							 TA171287	

Table 3-1. PREVENTIVE MAINTENANCE CHECKS AND SERVICES-Continued

NOTE: Within designated interval, these checks are to be performed in order listed.

B-Before A-After
D-During W-Weekly
M-Monthly

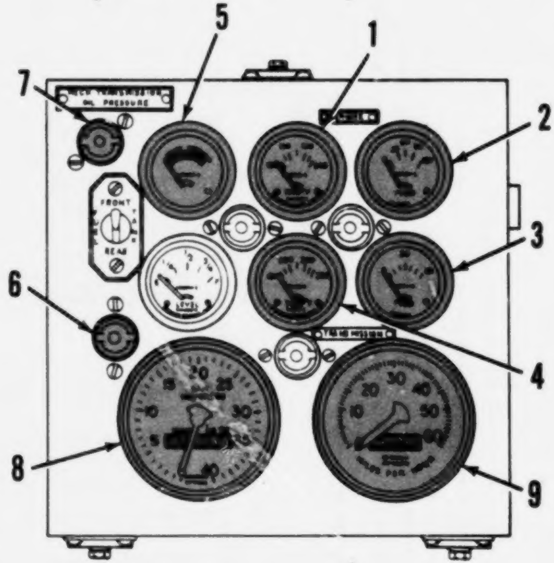
Item No.	Interval					Item to be Inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment is Not Ready/ Available If:
	B	D	A	W	M			
19						Instrument Panel	During operation, observe normal readings and operation of gages and warning lights.	
								
		X					A. Engine oil temperature gage (1) normal temperature range 140°-240°F.	Does not operate.
		X					B. Engine oil pressure gage (2) normal pressure 40-70 psi at 2400 rpm 180°F oil temperature.	Does not operate

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Table 3-1. PREVENTIVE MAINTENANCE CHECKS AND SERVICES-Continued

NOTE: Within designated interval, these checks are to be performed in order listed.

B-Before A-After
D-During W-Weekly
M-Monthly

Item No.	Interval					Item to be Inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment is Not Ready/ Available If:
	B	D	A	W	M			
		X					C. Transmission oil pressure gage (3) normal pressure 17 ± 2 psi.	Does not operate.
		X					D. Transmission oil temperature gage (4) normal temperature range 160°-280°F.	Does not operate.
		X					E. Battery-generator indicator (5) normal reading green zone for generator-yellow for battery.	
		X					F. Master warning light (6) and horn come on when: (1) Engine oil temperature reaches 245 ± 5°F. (2) Engine oil pressure is less than 13 psi at start and less than 9 psi when running. (3) Transmission oil temperature reaches 285°F.	
		X					G. Mechanical transmission warning light (7) comes on when oil pressure is 4 psi or less.	

Table 3-1. PREVENTIVE MAINTENANCE CHECKS AND SERVICES-Continued

NOTE: Within designated interval, these checks are to be performed in order listed.

B-Before
D-During
A-After
W-Weekly
M-Monthly

Item No.	Interval					Item to be Inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment is Not Ready/ Available If:
	B	D	A	W	M			
		X					H. Tachometer (8) and speedometer (9) should operate normally without excessive fluctuations or unusual noises.	If tachometer not operating.
							CAUTION Vehicle must be brought to a complete stop before shifting from low/high range to reverse.	
20		X				Controls, Steer Shift, Accelerator & Brake	A. Inspect and operate controls. Note any binding or excessive play in linkage during vehicle operation.	Performance or function function results in abnormal operation.
		X					B. Check brakes for ability to hold vehicle on inclines.	

Table 3-1. PREVENTIVE MAINTENANCE CHECKS AND SERVICES-Continued

NOTE: Within designated interval, these checks are to be performed in order listed.

B-Before
D-During
A-After
W-Weekly
M-Monthly

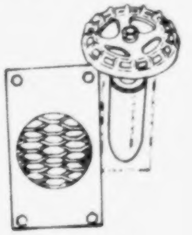
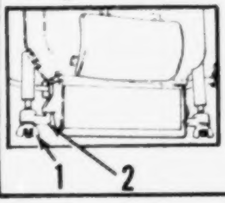
Item No.	Interval					Item to be Inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment is Not Ready/ Available If:
	B	D	A	W	M			
21		X				Generator Blower	Hold a hand up to the generator blower air intake grille. Feel for suction. 	
22		X				Unusual Noises	Be alert for unusual noises, odors or visual indications or problems in the engine, transmission, suspension or hydraulic systems.	
23		X				M17 Periscope	A. Check that wingnuts (1) on clamp assemblies (2) are tight and hold periscopes in place. Clean windows and check for overall damage. 	

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Table 3-1. PREVENTIVE MAINTENANCE CHECKS AND SERVICES-Continued

NOTE: Within designated interval, these checks are to be performed in order listed.

B-Before A-After
D-During W-Weekly
M-Monthly

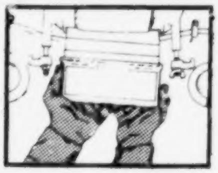
Item No.	Interval					Item to be Inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment is Not Ready/ Available If:
	B	D	A	W	M			
								
			X				B. Be alert to any moisture entering through periscope mounting (defective seal on periscope.	
24						M24/ M24A1 Periscope	NOTE Perform the following only when the M24/ M24A1 periscope is to be used. WARNING Be very careful. The periscope cable carries 16,000 volts. Do not turn system on until the cable is connected. CAUTION Do not expose periscope to direct sunlight.	
		X					A. Be alert to any slippage of vertical line of sight adjustment.	

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Table 3-1. PREVENTIVE MAINTENANCE CHECKS AND SERVICES-Continued

NOTE: Within designated interval, these checks are to be performed in order listed.

B-Before
D-During
A-After
W-Weekly
M-Monthly

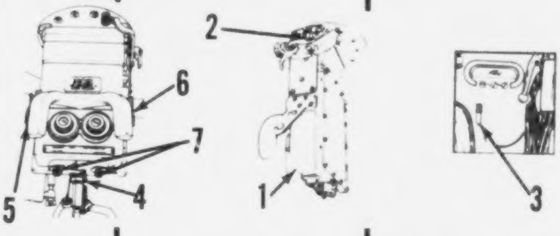
Item No.	Interval					Item to be Inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment is Not Ready/ Available If:
	B	D	A	W	M			
			X				B. Remove periscope (1); check for damage, clean, wipe dry, clean windows and eye lenses, stow.	
							 	
				X			C. Check retainers (2) so that they lock the periscope in place and power cable (3) is securely connected to periscope power receptacle (4). NOTE Allow at least 5 minutes warmup time before focusing or adjusting vertical line of sight. Check headrest clamping knobs (5). Knobs should lock headrest (6) in proper position for operator. Viewing through eyepieces, rotate left and right focus controls (7).	

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Table 3-1. PREVENTIVE MAINTENANCE CHECKS AND SERVICES-Continued

NOTE: Within designated interval, these checks are to be performed in order listed.

B-Before A-After
D-During W-Weekly
M-Monthly

Item No.	Interval					Item to be Inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment is Not Ready/ Available If:
	B	D	A	W	M			
							Image should appear sharp and clear with no double image. There should be no evidence of dirt, moisture, scratches or other damage on optical elements. The image should not flicker and you should not hear any sparking. Visually inspect general condition and completeness. Touch up damaged paint. Wash headrest with warm, soapy water and dust with talcum.	
25						Intercommunications System and Radio Sets	NOTE Radio and intercom PMCS checks are found in TM 11-5820-401-10-2.	Refer to criteria in TM 11-5820-401-10-2.
		X					A. Check operation.	No means of communications between driver and commander.
		X					B. Check for unusual noises, interference or poor operation in general. Report all problems to organizational maintenance. Check equipment surfaces for damage, loose casings, missing parts, and cleanliness.	

Table 3-1. PREVENTIVE MAINTENANCE CHECKS AND SERVICES-Continued

NOTE: Within designated interval, these checks are to be performed in order listed.

B-Before
A-After
D-During
W-Weekly
M-Monthly

Item No.	Interval					Item to be Inspected	Procedures Check for and have repaired or adjusted as necessary	For Readiness Reporting Equipment is Not Ready/ Available If:
	B	D	A	W	M			
			X				C. Check all cables and connections for cracks, breaks, loose or broken connections. Have all damaged cables replaced and tighten all loose connections. Make sure all equipment is securely mounted. Tighten any loose hardware. Check all knobs and switches for firm and smooth operation.	No means of communications between driver and commander.
26	X			X		M239 Smoke Grenade Launcher	NOTE For detailed instructions on the maintenance of the M239 Smoke Grenade Launcher, see TM 9-1330-200-12.	
27		X		X		Machine-gun and Mount	NOTE For detailed instructions on the maintenance of the M2, Cal. 50 machine-gun mount, see TM 9-1005-213-10.	
28				X		Canvas Cover for Machine-gun	Inspect for tears and material deterioration. If damage exists, replace cover. NOTE Perform the following only when used. Otherwise check weekly.	

Table 3-1. PREVENTIVE MAINTENANCE CHECKS AND SERVICES-Continued

NOTE: Within designated interval, these checks are to be performed in order listed.

B-Before A-After

D-During W-Weekly

M-Monthly

Item No.	Interval					Item to be Inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment is Not Ready/ Available If:
	B	D	A	W	M			
29					X	Air Purifier	Turn switch to ON, check motor for smooth operation, and check outlets for air flow (refer to organizational maintenance).	Air flow at any air duct is blocked.
30	X					Cable Assembly	Check for worn or cracked insulation and loose connections.	
31	X					Hoses	Check for wear, damage, or deterioration.	Crew member NBC hoses are damaged.
32	X					Filter Unit	Inspect entire assembly for dents, cracks, or missing parts.	
33	X					Tank Gas Mask	Inspect for holes, loose eyepiece, and separation of mask from tank.	
34	X				X	Exhaust Smoke Generating System	Check for security of smoke generating components.	

3-9. General Procedures for All Services and Inspections (Deleted)

3-10. Preventive Maintenance by Operator and Crew (Deleted)

3-11. Specific Procedures for Operator and Crew (Deleted

Figure 3-1. Deleted.

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Section V. TROUBLESHOOTING

3-12. Scope.

a. This section contains the information you will need to locate and correct some of the problems which could occur in the vehicle. Troubleshooting is a step-by-step method of discovering the trouble, testing or inspecting for the cause and correcting it. If a problem shows up that you can't fix, it is not listed or if it is not within your level of repair, notify organizational maintenance.

b. Always be on the alert for unusual noises. Check out any evidence of failure or malfunction. Inspect all systems or equipment that do not operate at peak performance. Discovering and correcting a problem when it first appears will usually result in less serious damage to the vehicle and provide safer conditions for you and the crew.

3-13. Troubleshooting Table.

Table 3-2 provides the troubleshooting malfunctions, tests or inspections and corrective actions that can be covered by you.

Table 3-2. Troubleshooting Procedures

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

NOTE

If you find something wrong that is not listed in this table or something you can't fix, notify organizational maintenance.

ENGINE

1. ENGINE FAILS TO CRANK OR CRANKS SLOWLY WHEN START BUTTON IS PUSHED

Step 1. Check MASTER switch for proper functioning with transmission shift lever in PARK (P) position. Turn on several items of electricial equipment and see if they operate.

If equipment fails to operate, notify organizational maintenance.

Step 2. Check battery terminals and electrolyte level.

Fill electrolyte up to split rings and tighten any loose terminals. If batteries are still bad, notify organizational maintenance.

Step 3. Check for low battery charge indicated on BATTERY-GENERATOR gage.

Charge up batteries with APU (para. 2-27c).

Step 4. Check starting and generating system for broken wires and loose connections.

Tighten all loose connections or notify organizational maintenance of any broken wires.

Table 3-2. Troubleshooting Procedures-Continued

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

---

1. ENGINE FAILS TO CRANK OR CRANKS SLOWLY WHEN START BUTTON IS PUSHED - Continued

Step 5. Check for unusual noises or vibration when START button is pushed.

If starter attempts to operate but engine fails to turn over, engine may be mechanically seized. Notify organizational maintenance.

2. ENGINE CRANKS BUT FAILS TO START

Step 1. Check fuel controls for proper setting.

a. Be sure enough fuel is present.
b. Push in FUEL SHUTOFF handle.
c. Turn on FUEL PUMP switch.
d. Operate purge pump.

Step 2. Check for bent or loose fuel lines.

Notify organizational maintenance.

Step 3. Extremely cold temperatures prevent engine from starting.

See figure 2-44 and attempt to start using cold start procedures.

3. ENGINE STARTS, BUT FAILS TO KEEP RUNNING

Step 1. Check fuel level.

Engine may start and run on fuel remaining in engine fuel system and stop when fuel is gone. If engine starts each time the purge pump is used but will not continue to run, notify organizational maintenance.

Table 3-2. Troubleshooting Procedures-Continued

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

---

3. ENGINE STARTS, BUT FAILS TO KEEP RUNNING - Continued

Step 2. Check for air trapped in fuel lines.

Operate purge pump until engine continues to run.

Step 3. Check air cleaner air restriction gages (para. 3-33).

Service air cleaners (para. 3-34).

4. ENGINE STOPS WHILE OPERATING VEHICLE UPHILL DURING RECOVERY OR GOING UP A STEEP GRADE

Check forward fuel tank valve to see if it is open.

Close forward tank bypass valve (AR, fig. 2-8). If rear tanks are 1/2 or more full, move vehicle to level area or downgrade. Open forward bypass valve to allow fuel to flow into forward tank. Then close forward bypass valve.

NOTE

Operation for long periods in recovery operation with vehicle in fixed position on incline will lower front fuel tank supply below pump inlet.

5. ENGINE WILL NOT RETURN TO IDLE

Check for loose, missing or bent accelerator or hand throttle linkage.

Notify organizational maintenance.

Table 3-2. Troubleshooting Procedures-Continued

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

6. ENGINE RUNS ROUGHLY AND MISFIRES

Step 1. Check air cleaner air restriction gages (para. 3-33).

Service air cleaners (para. 3-34).

Step 2. Check for fuel leaks.

Turn off engine and notify organizational maintenance.

Step 3. Engine operating at below normal temperature (one or more cylinders not firing).

Run engine at a higher rpm (1,000 to 2,000 rpm for 3 to 5 minutes). If engine continues to misfire, notify organizational maintenance.

7. ENGINE LACKS POWER

Step 1. Check for bent, broken or missing throttle linkage.

Notify organizational maintenance.

Step 2. Check air cleaner restriction gages (para. 3-33).

Service air cleaners and air inlets (para. 3-34).

Step 3. Check vehicle steering. If vehicle tends to pull in either direction, brakes could be adjusted too tightly causing excessive drag.

Notify organizational maintenance.

Table 3-2. Troubleshooting Procedures-Continued

MALFUNCTION

TEST ON INSPECTION

CORRECTIVE ACTION

7. ENGINE LACKS POWER - Continued

Step 4. Check track tension.

Adjust if necessary (fig. 3-4).

Step 5. Check transmission oil level.

Fill as specified in LO 9-2350-256-12.

8. EXCESSIVE OIL BEING USED

Check for external oil leaks.

Notify organizational maintenance.

9. LOW OIL PRESSURE

> CAUTION
>
> Do not operate engine with low oil pressure. Serious damage could result.

Step 1. Check oil level.

Fill as specified in LO 9-2350-256-12.

Step 2. Check oil lines, coolers, tubes and pump for leaks.

Notify organizational maintenance.

10. ENGINE OVERHEATS

Step 1. Check oil level.

Fill as specified in LO 9-2350-256-12.

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Table 3-2. Troubleshooting Procedures-Continued

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

---

10. ENGINE OVERHEATS - Continued

Step 2. Check oil lines, coolers, tubes and pump for leaks.

Notify organizational maintenance.

Step 3. Check cooling fans for proper operation.

Notify organizational maintenance.

Step 4. Check track tension.

Adjust to proper tension (fig. 3-4).

Step 5. Brakes too tight causing drag and sluggish handling.

Notify organizational maintenance.

STARTING SYSTEM

11. NO SOUND FROM STARTER WHEN THE MAIN ENGINE START BUTTON IS PUSHED

Step 1. Check MASTER switch and transmission shift lever for proper setting.

Place shift lever in PARK (P) and turn MASTER switch ON.

Step 2. Check for loose battery connections, missing, loose or broken wires.

Tighten battery connections. Notify organizational maintenance of any other malfunction.

Table 3-2. Troubleshooting Procedures-Continued

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

---

12. STARTER OPERATES SLOWLY BUT DOES NOT START ENGINE

Step 1. Check for low battery charge indicated on BATTERY-GENERATOR gage.

Run APU until batteries are charged (para. 2-27c). Slave start vehicle if necessary (fig. 2-13).

Step 2. Check for loose connections or broken wires.

Notify organizational maintenance.

Step 3. Check for any unusual vibrations or noises which could mean a mechanical seizure.

Notify organizational maintenance.

13. LIGHTS DIM OR VENTILATING BLOWER MOTOR SLOWS DOWN WITH ENGINE OFF

Step 1. Check for low battery charge indicated on BATTERY-GENERATOR gage.

Run APU to charge batteries (para. 2-27c). Slave start vehicle if necessary (fig. 2-13).

Step 2. Check battery cables and terminals for corrosion or loose connections.

Clean and tighten terminals and connections.

Step 3. Check electrolyte level in batteries.

Add electrolyte up to split rings (TM 9-6140-200-12).

Table 3-2. Troubleshooting Procedures-Continued

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

---

14. LOW OIL PRESSURE

Step 1. Check oil level.

Add oil as specified in LO 9-2350-256-12.

Step 2. Check for leaking, damaged or loose oil line connections.

Notify organizational maintenance.

15. EXCESSIVE OIL BEING USED

Step 1. Check engine compartment for leaks.

Notify organizational maintenance.

Step 2. Check engine oil level for overfill.

Drain to proper level (LO 9-2350-256-12).

Step 3. Check air cleaners for dirt and debris which may get into the cylinders causing excessive wear.

Clean air cleaners (fig. 3-19) and notify organizational maintenance.

16. NO OIL PRESSURE

Step 1. Check engine oil level.

Fill as specified in LO 9-2350-256-12.

Step 2. Check for excessive oil leak.

Notify organizational maintenance.

Table 3-2. Troubleshooting Procedures-Continued

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

---

17. ENGINE OIL TEMPERATURE EXCEEDS 240°F

Step 1. Check engine oil high temperature warning light, gage, and horn.

Stop engine and notify organizational maintenance.

Step 2. Problem occurs during towing operation.

Shift transmission to a lower gear.

OPERATOR'S CONTROLS

18. VEHICLE WILL NOT STEER OR STEERS IN ONLY ONE DIRECTION

Check for bent, missing, loose or improperly adjusted steering control linkage.

Notify organizational maintenance.

19. BRAKES WILL NOT EFFECTIVELY STOP VEHICLE OR DRAG AT ONE OR BOTH SIDES

Check for loose, missing, bent or broken linkages.

Notify organizational maintenance.

20. ENGINE DOES NOT RESPOND PROPERLY TO THROTTLE CONTROL

Check for loose, missing, bent, broken or improperly adjusted accelerator control linkage.

Notify organizational maintenance.

Table 3-2. Troubleshooting Procedures-Continued

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

---

21. PURGE PUMP HANDLE OPERATES TOO EASILY

Check for broken purge pump lines, bad pump or clogged lines to pump.

Purge pump should operate with some resistance. If handle operates too easily, notify organizational maintenance.

TRANSMISSION

22. VEHICLE WILL NOT DRIVE IN FORWARD OR REVERSE GEARS

Check for bent, missing, loose or improperly adjusted shift linkage.

Notify organizational maintenance.

23. TRANSMISSION OIL PRESSURE LOW

Step 1. Check oil level.

Fill as specified in LO 9-2350-256-12.

Step 2. Check for leaks.

Notify organizational maintenance.

24. TRANSMISSION OIL HIGH TEMPERATURE WARNING LIGHT AND HORN COME ON

Step 1. Check oil coolers for restriction of air flow.

Clean away debris. If problem continues, notify organizational maintenance.

Table 3-2. Troubleshooting Procedures-Continued

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

---

24. TRANSMISSION OIL HIGH TEMPERATURE WARNING LIGHT AND HORN COME ON - Continued

Step 2. Check transmission oil level.

Fill as specified in LO 9-2350-256-12.

Step 3. Problem occurs during towing operation or when operating on rough ground.

Shift transmission to lower gear.

25. VEHICLE DRIVES IN ONE GEAR, CREEPS IN NEUTRAL, BUT STALLS WHEN SHIFTED TO ANOTHER GEAR

Check for missing, bent or loose shift linkage.

Notify organizational maintenance.

26. VEHICLE HAS GOOD STEERING IN ONE DIRECTION BUT NOT IN OPPOSITE DIRECTION OR GRABS

Check steering control linkage for missing, bent or loose parts.

Notify organizational maintenance.

27. VEHICLE PULLS TO ONE SIDE WHEN NO STEERING IS APPLIED

Step 1. Check track tension.

Adjust track tension (fig. 3-4).

Step 2. Check steering control linkage for bent, loose or missing parts.

Notify organizational maintenance.

Table 3-2. Troubleshooting Procedures-Continued

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

WINCHES AND BOOM

28. MAIN OR HOIST WINCH SHIFT LEVER WILL NOT SHIFT

Check linkage for bent, missing or loose parts.

Notify organizational maintenance.

29. MAIN OR HOIST WINCH BRAKE OR HOISTING BOOM WILL NOT HOLD LOAD OR WILL NOT WORK

Check oil level in hydraulic oil tank.

Fill as specified in LO 9-2350-256-12.
Notify organizational maintenance.

30. MAIN OR HOIST WINCH WILL NOT OPERATE IN BOTH DIRECTIONS IN LOW OR HIGH GEAR

Listen for unusual noises during winch operation.

Notify organizational maintenance.

31. MAIN OR HOIST WINCH OR HOISTING BOOM WILL NOT DEVELOP FULL POWER OR SPEED

Check oil level in hydraulic oil tank.

Fill as specified in LO 9-2350-256-12.

32. WINCH OPERATES ON AUXILIARY HYDRAULIC POWER BUT DOES NOT OPERATE ON MAIN ENGINE HYDRAULIC POWER

Malfunction in the main hydraulic system.

Notify organizational maintenance.

Table 3-2. Troubleshooting Procedures-Continued

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

AUXILIARY HYDRAULIC SYSTEM

33. AUXILIARY HYDRAULIC SYSTEM WON'T WORK

Check oil level in hydraulic oil tank.

Fill as specified in LO 9-2350-256-12. Notify organizational maintenance if problem continues.

34. BOOM AND SPADE WON'T WORK WITH APU ENGINE RUNNING

Check APU emergency winch control valve.

Turn valve to NORMAL OPERATION position (Step 4a, fig. 2-26). If problem continues, notify organizational maintenance.

LIGHT SYSTEM

35. LIGHTS DO NOT WORK

Check MASTER switch.

Turn MASTER switch on.

36. ANY LIGHTS EXCEPT WARNING LIGHTS AND FLASHER LIGHT FLICKER, WILL NOT GO OFF OR WILL NOT BURN

Step 1. Check lamp.

Tighten or replace as necessary.

Step 2. Check for broken switches and broken wires.

Notify organizational maintenance.

Table 3-2. Troubleshooting Procedures-Continued

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

---

37. WARNING LIGHT WILL NOT BURN

Check lamp and connectors.

Replace lamp and notify organizational maintenance if problem continues.

38. FLASHER LIGHT BURNS BUT FAILS TO FLASH

Check flasher unit connections.

Notify organizational maintenance.

39. FLASHER LIGHT WILL NOT BURN

Check lamp and switch connections.

Replace lamp if required. Notify organizational maintenance if problem continues.

RADIO INTERFERENCE SUPPRESSION SYSTEM

40. RADIO INTERFERENCE (STATIC) WITH VEHICLE NOT IN MOTION BUT WITH ENGINE RUNNING

Check battery ground connection.

Tighten as required.

41. RADIO INTERFERENCE WITH ELECTRICAL UNITS IN OPERATION (HEATER, BLOWER, ETC.)

Check for broken, missing or loose connections or wiring.

Tighten any loose bonding or mounting connections and notify organizational maintenance of any malfunctions in electrical components.

Table 3-2. Troubleshooting Procedures-Continued

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

AUXILIARY POWER UNIT

42. ENGINE FAILS TO START

Step 1. Check for low battery charge indicated on BATTERY-GENERATOR gage.

Slave start the vehicle (fig. 2-13).

Step 2. Check battery connections.

Clean and tighten connections.

Step 3. Check air intake for restrictions.

Remove any restrictions and clean air filter (fig. 3-2).

WARNING

The APU access door must be secured prior to performing any maintenance checks. Refer to Warning on p. 2-106 for procedure to secure door when open.

Step 4. Check fuel level.

Refuel vehicle.

Step 5. Have organizational maintenance troubleshoot starting system according to procedures in TM 9-2350-256-20

Table 3-2. Troubleshooting Procedures-Continued

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

AUXILIARY POWER UNIT

43. ENGINE STARTS, BUT FAILS TO KEEP RUNNING OR RUNS ROUGHLY

Step 1. Check for water in fuel filters.

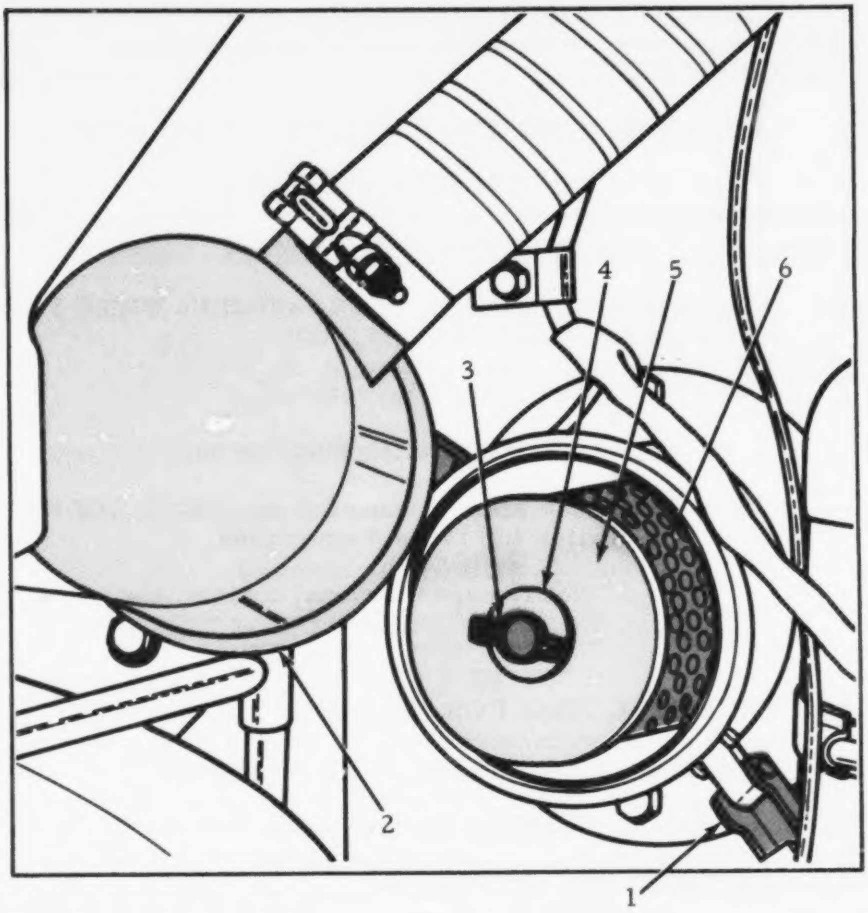
Drain filters (AF, fig. 2-8) of condensation.

Step 1. Check air intake for restrictions.

Remove restrictions or clean filter (fig. 3-2).

WARNING

NBC contaminated filter must be handled using adequate precautions (FM21-40) and must be disposed of by trained personnel.



1. Open filter housing clips (1) to remove housing (2) from filter.
2. Remove wing nut (3), washer (4), plate (5) and filter (6).
3. If dirty and clogged, clean in the same way you would the main air cleaner filter. See figure 3-19, steps 4 through 10, for cleaning instructions.

TA038844

Figure 3-2. APU air filter maintenance.

Table 3-2. Troubleshooting Procedures-Continued

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

VENTILATING BLOWER

44. VENTILATING BLOWER DOES NOT RUN WHEN VENT BLOWER SWITCH IS TURNED ON

Step 1. Check MASTER switch.

MASTER switch must be on.

Step 2. Check MASTER switch and VENT BLOWER switch for loose connections.

Notify organizational maintenance.

PERSONNEL HEATER

45. EXCESSIVE TIME FOR IGNITION

Check battery and electrical connections.

Notify organizational maintenance.

46. HEATER FAILS TO IGNITE

Step 1. Check vehicle fuel level.

Add fuel to tanks as required.

Step 2. Check press-to-test for glow.

Notify organizational maintenance if light stays out.

47. HEATER FAILS TO CONTINUE BURNING

Step 1. Check fuel level.

Add fuel to tanks as required.

Table 3-2. Troubleshooting Procedures-Continued

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

---

47. HEATER FAILS TO CONTINUE BURNING - Continued

Step 2. Check for loose cable connections.

Tighten connections. If problem continues, notify organizational maintenance.

48. SMOKE FROM HEATER

Check exhaust for restrictions.

Remove restrictions.

TRACKS AND SUSPENSION

49. VEHICLE LEANS TO ONE SIDE

Step 1. Pry wheels with crowbar on low side of vehicle to check for broken torsion bar.

If wheel can be lifted, notify organizational maintenance.

Step 2. Check for unequal track tension.

Adjust track tension (fig. 3-4).

50. THUMPING NOISE AS TRACK PASSES OVER TRACK SUPPORT ROLLERS

Check for DEAD track link by driving vehicle slowly forward and watching for a DEAD link which will fall below the level of the other links.

Replace DEAD link (fig. 3-5).

Table 3-2. Troubleshooting Procedures-Continued

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

---

51. THUMPING NOISE FROM SUSPENSION SYSTEM

Check for wheels that have base separation of rubber from the metal of one half the width of original contact around the entire wheel or if damage to tire is enough to cause thumping during use. Check for loose, damaged or leaking shock absorbers. Check track tension and overheated hubs.

Notify organizational maintenance. Adjust tract tension if necessary (fig. 3-4).

GAS-PARTICULATE FILTER UNIT

52. INSUFFICIENT AIR FLOW AT ALL STATIONS

Step 1. Check for kinked or pinched air hoses. Check for loose connections.

Straighten or replace hoses. Tighten loose connections.

Step 2. Check for clogged particulate filters or low electrical power.

Notify organizational maintenance.

53. AIR FLOW IS TOO HIGH AT ALL STATIONS

Air purifier is out of adjustment.

Notify organizational maintenance.

Table 3-2. Troubleshooting Procedures-Continued

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

---

54. GAS-PARTICULATE FILTER UNIT WILL NOT OPERATE WHEN SWITCH IS ON

Step 1. Ground wire is loose or missing.

Notify organizational maintenance.

Step 2. Electrical cable assemblies are loose or missing.

Notify organizational maintenance.

Step 3. Switch or circuit breaker is defective.

Notify organizational maintenance.

Section VI. TRACK AND SUSPENSION MAINTENANCE

3-14. General.

This section provides information for track tension adjustment, disconnecting the track, track shoe replacement, and track removal and installation. Notify organizational maintenance for any additional service.

3-15. Track Inspection and Adjustment.

a. Inspection. See figure 3-3 for a guide to inspecting the tracks and suspension system.

b. Adjustment. See figure 3-4 for track adjustment instructions.

3-16. Track Shoe Replacement.

See figure 3-5 for track disconnect and track shoe replacement instructions.

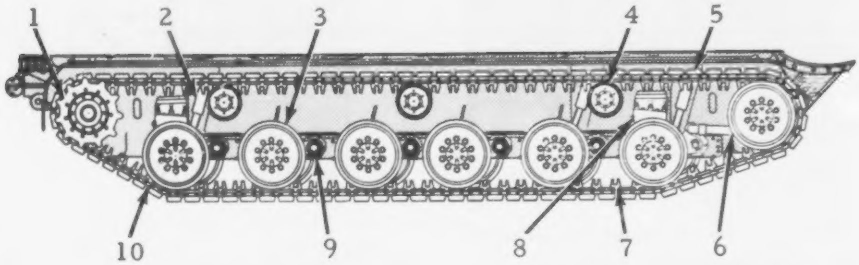
3-17. Track Removal.

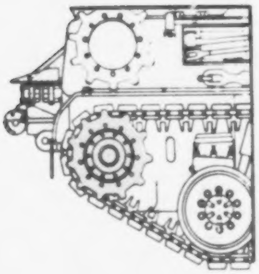
See figure 3-6 for track removal instructions.

3-18. Track Installation and Connection.

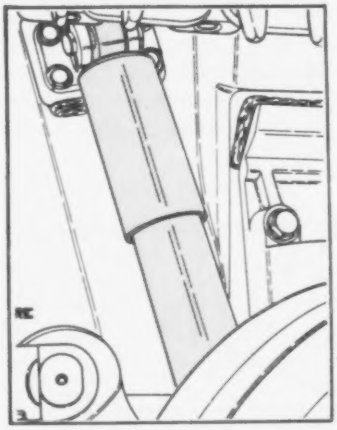
See figure 3-7 for instructions on installing and connecting the track.

Check the suspension system each day before you use the vehicle.

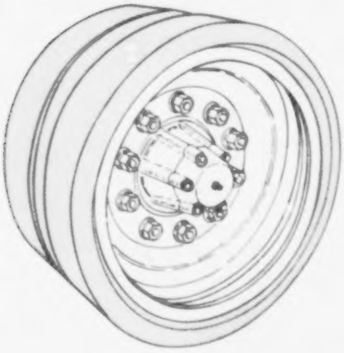




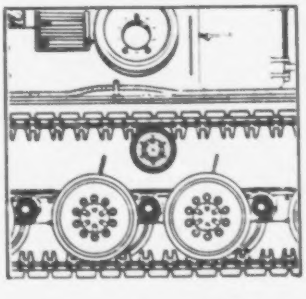
1. LOOSE, WORN OR DAMAGED DRIVE SPROCKETS.



2. DAMAGED SHOCK ABSORBERS.



3. LOOSE OR DAMAGED ROAD WHEEL OR WHEEL TIRE.



4. LOOSE OR DAMAGED TRACK SUPPORT ROLLER OR ROLLER WHEEL TIRE.

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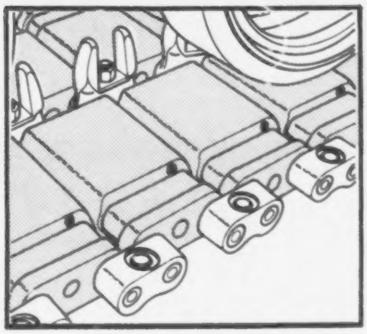
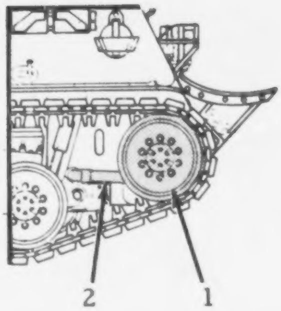
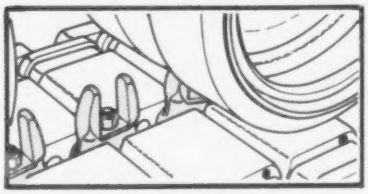
Figure 3-3. Suspension system inspection (Sheet 1 of 2).



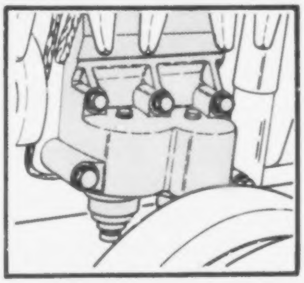
5. DAMAGED TRACK SHOES. Check grouser height for 3/8 inch or more. Check for missing rubber or rubber worn down to the pins.



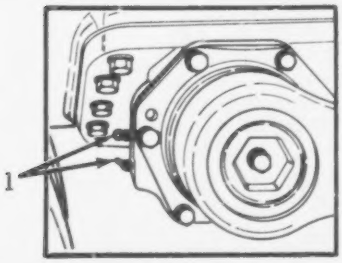
6. LOOSE OR DAMAGED COMPENSATING IDLER WHEEL (1) OR ADJUSTING LINK (2).



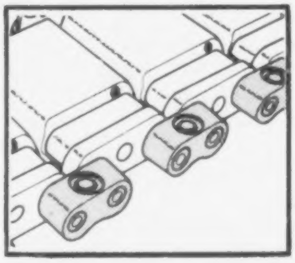
7. LOOSE OR DAMAGED TRACK CENTER GUIDES.



8. BROKEN BUMPER SPRINGS.



9. BROKEN OR DAMAGED LUBRICATION FITTINGS (1).



10. LOOSE OR DAMAGED TRACK SHOE END CONNECTORS.

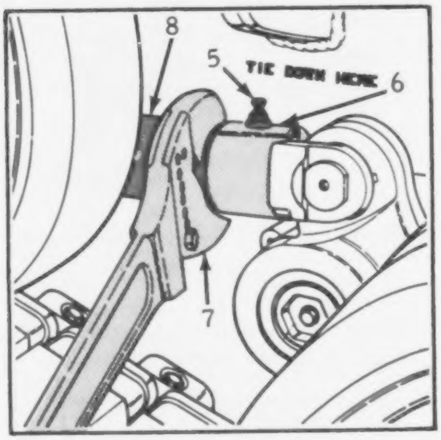
TA038846

Figure 3-3. Suspension system inspection (Sheet 2 of 2).

1. Move the vehicle back and forth a few times over hard, level ground. Coast to a stop without braking. Center track shoe (1) over No. 2 support roller (2).

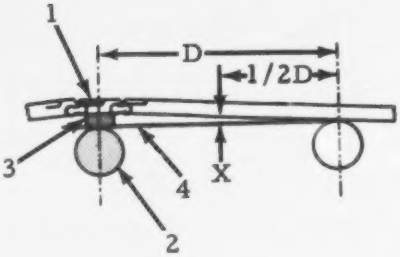
2. Pry up track and place a 6-inch square by 1-inch thick block (3) between No. 2 roller and track.

3. Place a straight edge or a taut line (4) flush with the tops of No. 2 and No. 3 track support rollers.



NOTE

If shaft (8) of adjusting link shows a red groove, stop adjusting, fully decrease tension, and remove one shoe assembly (fig. 3-5). Readjust track.



4. Measure distance between the centers of No. 2 and No. 3 rollers (D above).

5. Loosen lock screw (5) on track adjusting link (6).

6. Use the track adjusting wrench (7) to increase or decrease tension.

7. Stop when measured clearance is 1/8 to 3/16 inch from top of line or straight edge (4 above) to bottom of track midway between support rollers at point X (1/2 D).

8. Tighten lock screw (5) on track adjusting link. Remove line or straight edge and block.

TA038847

Figure 3-4. Track tension adjustment.

1. Loosen track tension (fig. 3-4).

NOTE

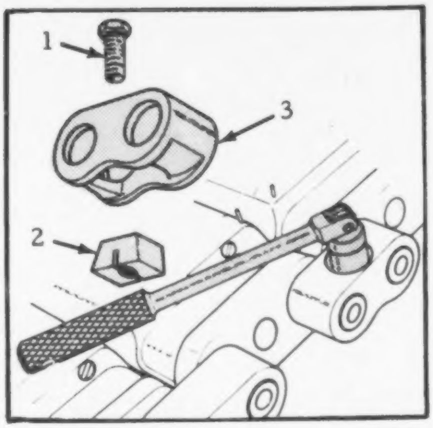
Disconnect track between idler wheel and first road wheel.

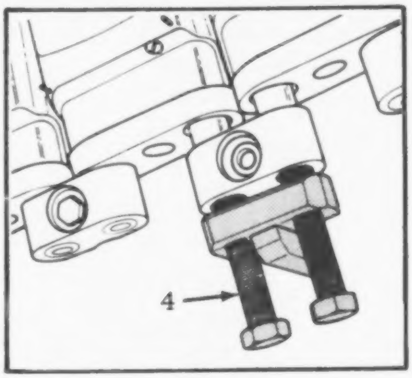
WARNING

When breaking track stand clear to prevent injury to personnel.

2. Remove bolts (1) and wedges (2) from end connectors (3). When you loosen the bolt a few turns, rap sharply to loosen wedge.

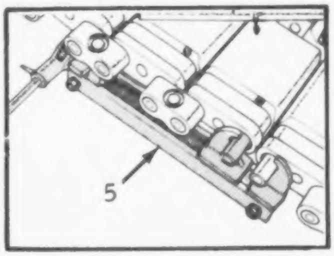
3. Remove end connector using puller (4). Tighten puller screws against end of track link pins. Strike heads of screws sharply with a hammer to help loosen end connector from pin. Take up the slack by tightening the screws each time. Tighten the screws equally so connector moves squarely off the pins. Stop using the hammer when just tightening the screws moves the connector. Stop when the connector moves 1 inch from the track.





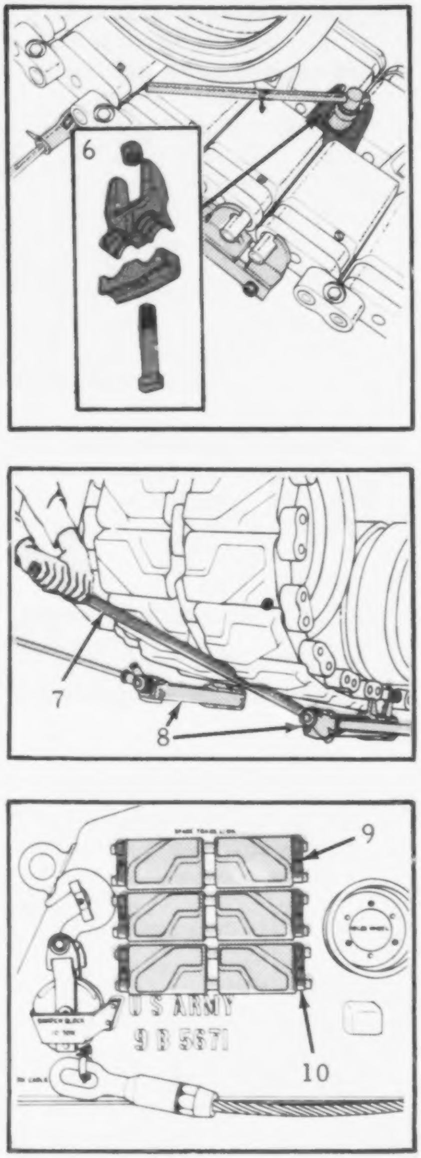
NOTE

Remove inside and outside end connectors on track.



TA038939

Figure 3-5. Track disconnect and track shoe removal (Sheet 1 of 2).



4. Install track jacks (5) and complete removal of end connectors.

5. Remove track center guide (6) after installing track jacks.

NOTE

Use socket 10894847 with socket wrench or impact wrench for center guide bolt.

6. Loosen track jacks (8) evenly.

7. Hold track up with bar (7) and remove track jacks (8).

8. Separate track.

9. Remove center guide and end connectors of track shoe (s) to be replaced.

10. Remove track shoe (s) from stowage by loosening nuts (9) and clamps (10).

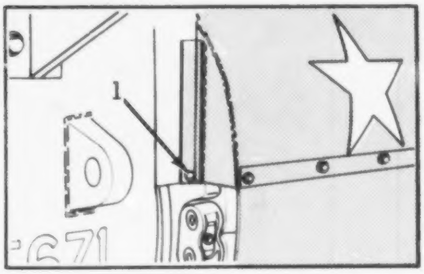
11. Reverse these instructions to replace the shoe (s) and connect the track.

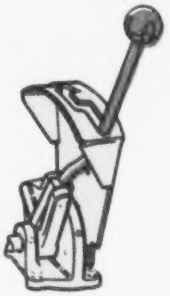
12. As soon as possible, notify organizational maintenance to torque disturbed end connector bolts to 140 to 160 lbs. ft. and center guide to 300 to 320 lbs. ft, and again after 50 miles.

TA125572

Figure 3-5. Track disconnect and track shoe removal (Sheet 2 of 2).

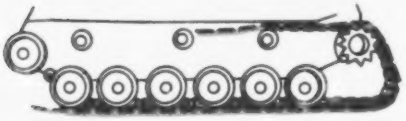
1. Disconnect the track (fig. 3-5).
2. If both tracks are to be removed, do one at a time.





3. Remove screws and washers (1) from rear fender section so it can swing up if track hits it.

4. Start engine (fig. 2-11) and hold brakes. Shift transmission to R.



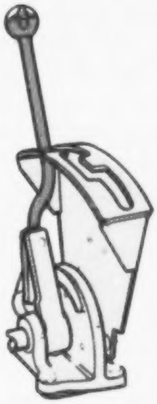
5. Increase engine power very SLOWLY when you move the vehicle to the rear.

NOTE

When moving in reverse, turn steering wheel right if removing left track, left if removing right track.

NOTE

Vehicle may be pulled if it can't go under its own power.



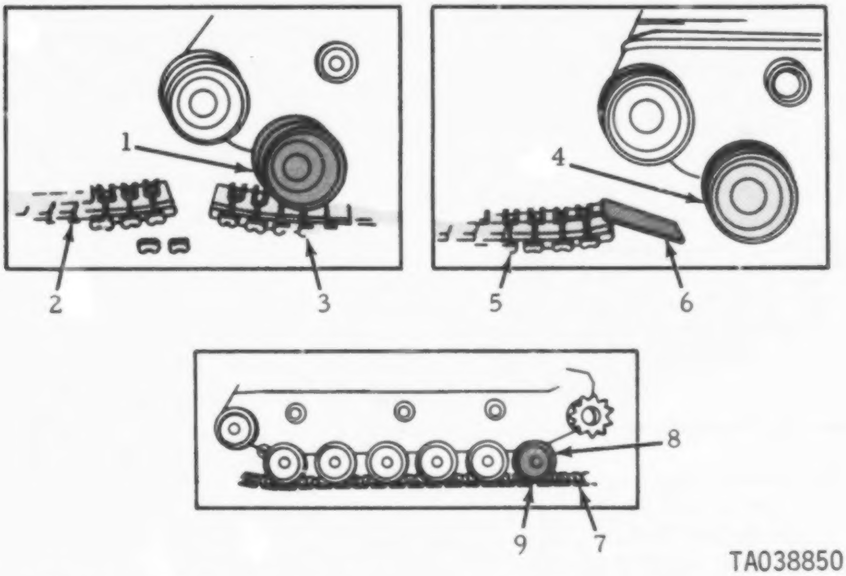
6. Keep a constant, slow speed so the track does not foul up in the support rollers.

7. As soon as track leaves sprocket, shift to P, lock steering wheel and brake and stop engine (fig. 2-19).

Figure 3-6. Track removal. TA171243

1. Installing new track (2) with vehicle road wheels resting on old tracks (3). Lay out replacement track in line with road wheels (1) in front or rear of vehicle with points of "V" pattern directed toward rear. Join replacement track to old track temporarily with two end connectors. Do not install wedges or bolts.

2. Installing new or thrown track (5) with road wheels (4) resting on ground. Place heavy metal plate or sturdy wood plank (6) on track link nearest vehicle to form a ramp. If plate or plank is not available, dig a trough under first few track links so that upper surfaces of links are level with ground surface.



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3. Move vehicle forward or backward onto track and position the vehicle so that the center of the rear road wheel (8) is resting on the 16th track link (9) from the rear of the track (7).

4. To steer vehicle when driving forward:

   a. Turn steering wheel right for right track installation.

   b. Turn steering wheel left for left track installation.

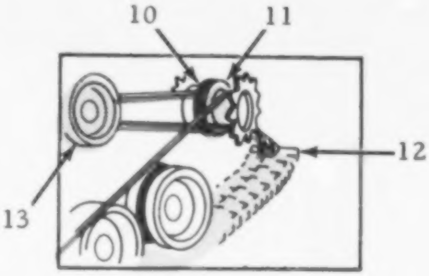
   c. Turn steering wheel opposite direction for reverse.

Figure 3-7. Track installation and connection (Sheet 1 of 3).

5. Set vehicle brakes.

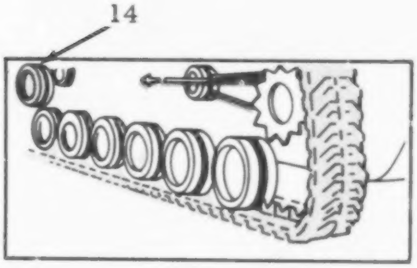
6. If a new track is being installed, disconnect and remove old track.

7. Secure rope (supplied with vehicle) to center of pin in rear link assembly (12) on track. Pass rope over center guide groove (10) of sprocket hub (11), around and between rear support roller (13), and back around the hub. Take two turns with rope around hub and pull free end of rope taut.

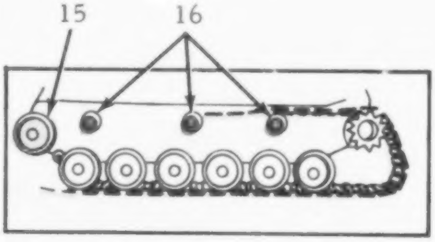


8. Start engine and allow it to idle. Place transmission shift lever in 1st and release brake.

9. Hold free end of rope taut and walk in front of and to the side of drive sprocket. This setup forms power pulley system which pulls rear end of track onto drive sprocket.



10. When teeth of drive sprocket have engaged at least three track links, apply brakes, place transmission shift lever in PARK (P) position, and remove rope from around hub of drive sprocket. With rope still secured to track link, extend rope forward over compensating idler wheel (14).



11. Place transmission shift lever in 1st and release brakes.

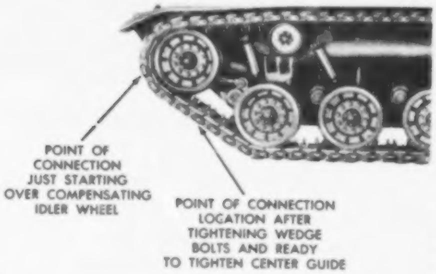
12. Operate engine at speed enough to drive sprocket and move free end of track over support rollers (16) and toward compensating idler wheel (15). Walk

TA038851

Figure 3-7. Track installation and connection (Sheet 2 of 3).

in front and slightly to one side of vehicle. Keep tension on rope to guide loose end of track over support rollers and compensating idler wheel.

13. When end of track has passed over compensating idler wheel and track is tight around drive sprocket, apply brakes, place transmission shift lever in "N" and shut off engine.


POINT OF CONNECTION JUST STARTING OVER COMPENSATING IDLER WHEEL
POINT OF CONNECTION LOCATION AFTER TIGHTENING WEDGE BOLTS AND READY TO TIGHTEN CENTER GUIDE

14. BY USING BAR (REFER TO FIG. B-5, ITEM 20) BRING BOTH ENDS OF TRACK TOGETHER AND INSTALL TRACK CONNECTING FIXTURE -8741739 SO THAT FIXTURE HOOKS CLAMP OVER TRACK LINK PINS (BOTH SIDES OF TRACK).

TIGHTEN FIXTURES EVENLY UNTIL LINK PINS ARE CLOSE ENOUGH TO INSTALL CENTER GUIDE. DO NOT TIGHTEN.

TIGHTEN TRACK CONNECTING FIXTURE - 8741739 EVENLY UNTIL END CONNECTORS CAN BE INSTALLED.

INSTALL END CONNECTORS AND TAP THEM ON TRACK LINK PINS.

TIGHTEN NUT DOWN AGAINST CENTER GUIDE.

CAUTION: DO NOT REMOVE FIXTURE BY STRIKING FIXTURE WITH HAMMER OR OTHER OBJECT.

REMOVE BOTH FIXTURES.

MOVE VEHICLE IN REVERSE SLOWLY AND STOP VEHICLE WHEN POINT OF CONNECTION IS JUST STARTING OVER COMPENSATING IDLER WHEEL. CHOCK ROAD WHEELS. INSTALL AND TIGHTEN WEDGE BOLTS SECURELY AND REMOVE ROAD WHEEL CHOCKS.

MOVE VEHICLE FORWARD AND STOP VEHICLE WHEN CENTER GUIDE, AT THE POINT OF CONNECTION, IS ACCESSIBLE AND ADJACENT TRACK LINKS ARE IN A STRAIGHT LINE (SAME PLANE). SET VEHICLE BRAKES AND TIGHTEN GUIDE NUT SECURELY.

ADJUST TRACK TENSION AS INSTRUCTED IN FIGURE 3-4

NOTE. CHECK TIGHTNESS OF WEDGE BOLTS AND CENTER GUIDE BOLTS WHEN THE NEXT AFTER-OPERATION PREVENTIVE-MAINTENANCE SERVICE IS PERFORMED.

TA038852

Figure 3-7- Track installation and connection (Sheet 3 of 3).

Section VII. VISION DEVICE MAINTENANCE

3-19. General.

a. Care in Handling Vision Devices.

(1) Vision devices are generally rugged but mishandling will result in damaging the equipment.

(2) Don't turn screws or other parts that are not needed for operation.

(3) Don't move any knob or part beyond its limit. Forcing parts will damage the device.

(4) Keep devices dry. Wipe completely before stowing periscopes.

(5) Properly stow or cover the M24 periscope when not in use.

(6) If a device fails to work, gets water in it or has damaged lenses, turn it over to organizational maintenance.

(7) Touch up scratched or chipped areas that expose bare metal. Never paint the whole device.

b. Lenses.

(1) Keep lenses clean and dry. Proper care will insure good vision. Keep M24 periscope protected from direct sunlight.

(2) It is PROHIBITED to clean lenses and windows with liquids, pastes, or abrasives.

(3) Use lens tissue only to wipe lenses and windows. Cloths are not permitted. Use a camel-hair brush to remove dirt or dust.

(4) Keep lenses free from oil or grease. Don't touch lenses or windows with your fingers. Use alcohol on lens tissue to remove grease or oil. If no alcohol is around use lens tissue. Don't rub too hard. The lenses have a special coating on them.

(5) Condensation might result if the lenses are cooler than the air. Place instrument in a warm place to dry. Keep away from high heat.

c. Lubrication. The M17 and M24 periscopes do not require lubrication.

3-20. M17 Periscope Replacement

See figure 3-8 for replacement procedures.

1. Loosen wing nuts (1) and turn retainers (2) until they clear periscope.
2. Pull down on periscope to remove it from recess.

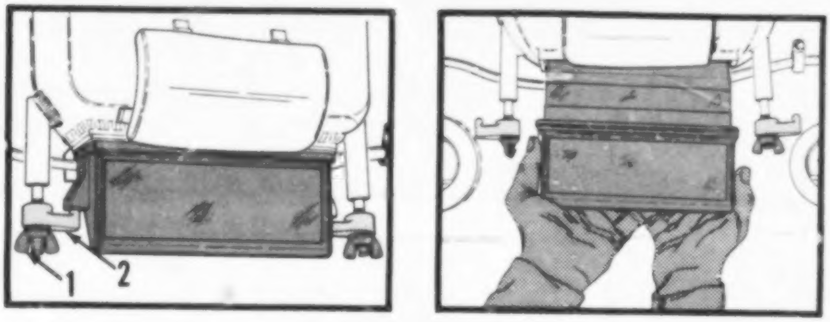


Figure 3-8. M17 periscope replacement.

NOTE

If the vehicle is equipped with an Exhaust Smoke Generating System, the location of the exhaust smoke bracket at right of steering column may make it harder to remove and replace the center M17 periscope.

See figure 3-8.1 for bracket replacement procedures.

1. Turn steering wheel (1) to the right.
2. Remove vehicle exhaust smoke bracket (2) by removing 2 screws and washers (3).
3. Reinstall bracket (2) after periscope has been installed.

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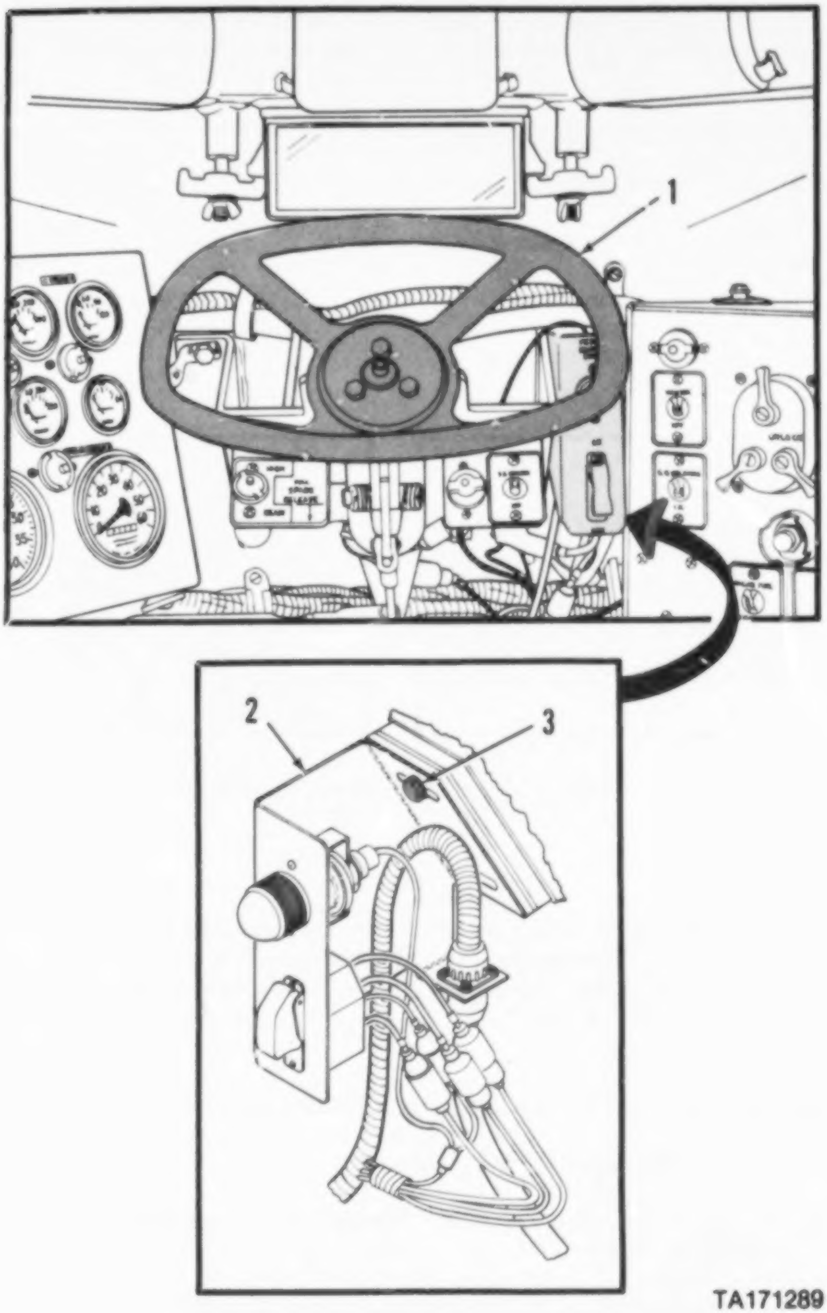


TA171289

Figure 3-8.1 Vehicle exhaust smoke bracket removal.

3-21. M24 Periscope Installation and Operation.

CAUTION

Do not open hatch with M24 periscope installed.

See figure 3-10 for instructions.

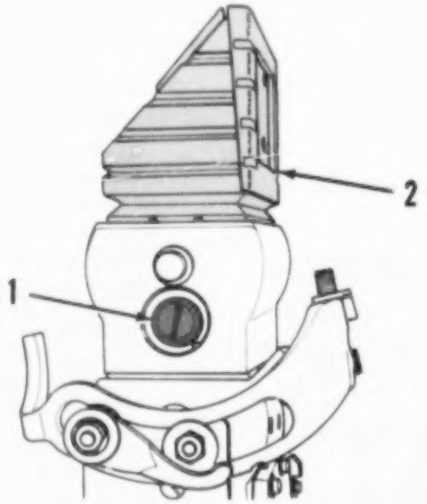
3-22. M24 Periscope Head Assembly Replacement.

See figure 3-9 for head assembly replacement.

3-23. Inspection of Vision Devices.

Perform the daily and weekly preventive-maintenance checks and services found in table 3-1.

1. Move latch (1) on each side 1/4 turn to the left.
2. Lift off head (2).



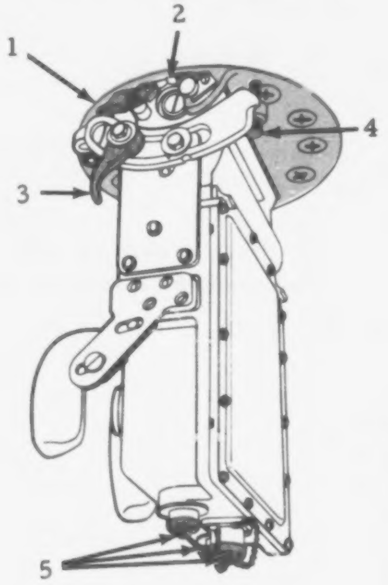
TA171290

Figure 3-9. M24 persicope head replacement.

WARNING

Be very careful. The periscope cable carries 16,000 volts. DO NOT turn system on until the cable is connected.

1. Push head of periscope into mount (1) until retainers (2) lock it in place.
2. Adjust elevation angle with lever (3). Tighten adjustment screw (4) on elevation clamp until clamp is seated firmly to mount. Unscrew the caps (5).



3. Remove power cable from stowage retainer. Insert cable plug into receptacle (7) and tighten.
4. To adjust headrest (8), loosen adjusting knobs (9), move headrest to desired position and tighten knobs.

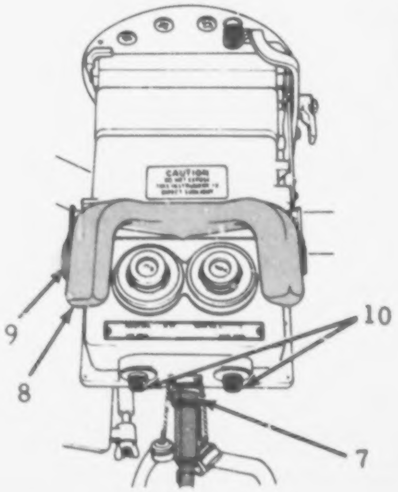


Figure 3-10. M24 periscope installation and operation (Sheet 1 of 2). TA125573

5. To operate - turn on MASTER switch and B. O. RECEIVER:

   a. For operator's infrared lighting, see figure 2-5, Sheet 8.

   b. Deleted.

6. To focus - wait 5 minutes for warmup. Adjust the left and right views for maximum sharpness. Loosen jamnut and turn focus screw (10).

CAUTION

Do not expose periscope to direct sunlight.

TA038856

Figure 3-10. M24 periscope installation and operation (Sheet 2 of 2).

Section VIII. CALIBER .50 MACHINEGUN AND MOUNT MAINTENANCE

3-24. Machinegun Replacement.

See figure 3-11.

3-25. Machinegun Mount Replacement.

See figure 3-12.

3-26. Service.

Refer to FM 23-65 and TM 9-1005-213-10 to see what maintenance and lubrication procedures you are authorized to do.

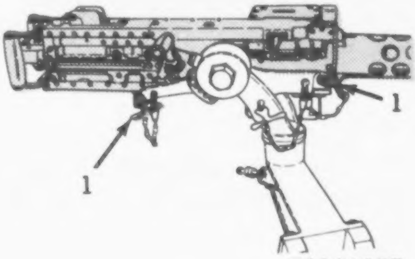
3-27. Machinegun Mount Operational Check.

See figure 3-13 for procedures in checking the machinegun mount operation.

WARNING

Be sure gun is not loaded before servicing.

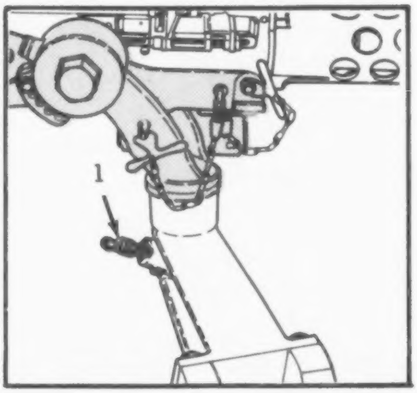
1. To remove:
   a. Pull 2 locking pins (1).
   b. Lift gun up from mount.



TA038857

Figure 3-11. Machinegun replacement.

1. Remove machinegun (fig. 3-11).
2. Loosen traverse locking screw (1).
3. Lift off mount slowly.
4. To install, reverse steps.



TA038866

Figure 3-12. Machinegun mount replacement.

WARNING

Be very careful whenever you work with the machinegun. Double check to be sure it is not loaded when servicing.

1. Loosen traverse locking screw (1).
2. Remove elevation lock pin (2).
3. Check mount for easy side-to-side and up-and-down movement.
4. Put back the lock pin (2) and tighten the traverse lock (1).

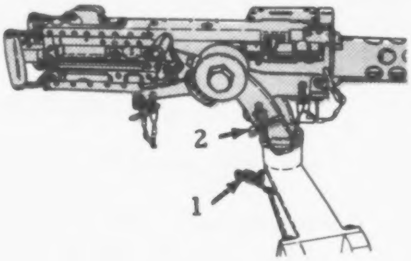


Figure 3-13. Operational check of machinegun mount.

TA038858

Section IX. INSTRUMENT, DOME AND BLACKOUT MARKER LIGHTS MAINTENANCE

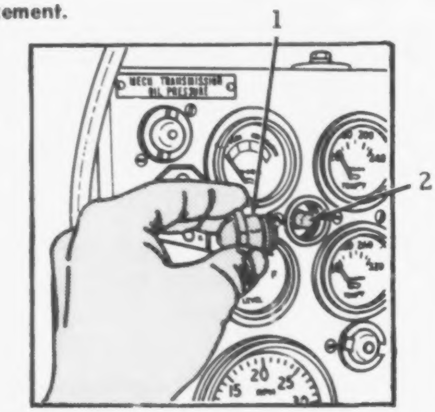
3-28. General.

You are authorized to change the dome, instrument and blackout marker lamps on the vehicle. Any other service needed in these areas will be referred to organizational maintenance.

3-29. Instrument Panel Light Lamp Replacement.

See figure 3-14.

1. Unscrew lens (1).
2. Push in and turn lamp (2) to left and remove.



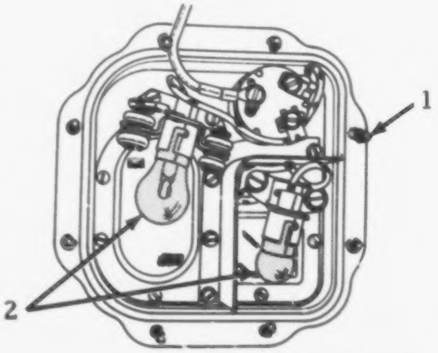
TA038865

Figure 3-14. Instrument light lamp replacement.

3-30. Dome Light Lamp Replacement.

See figure 3-15.

1. Loosen 8 screws (1) and remove dome light assembly from bracket.
2. Push in and turn lamps (2) to remove.

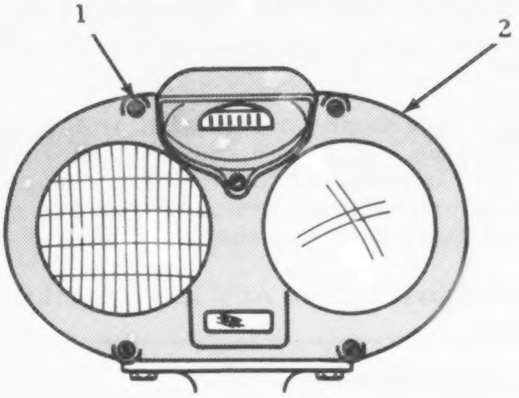


TA038859

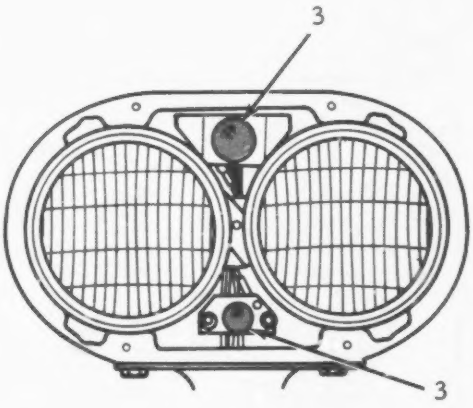
Figure 3-15. Dome light lamp replacement.

3-31. Blackout Marker Light Lamp Replacement.

See figure 3-16.



1. Loosen screws (1). and remove cluster cover (2).



2. Push in and turn lamps (3) to remove.

TA038860

Figure 3-16. Blackout marker light lamp replacement.

Section X. MAIN ENGINE AIR CLEANER MAINTENANCE

3-32. General.

a. The main engine air cleaner is the only source of air to the engine. It's your responsibility to insure that it is properly maintained to avoid damaging the engine. Maintenance instructions are given for the air intake screen, air cleaner dust cover and the filter element.

b. See figure 3-2 for APU air cleaner air filter maintenance.

3-33. Air Cleaner Air Filter Restriction Gage.

A restriction gage is located above each air cleaner (fig. 3-17). It reads green when the air cleaner is working properly. As the filter becomes restricted, a red sleeve (2) begins to drop into view. The air flow restriction is maximum when the red sleeve fully covers the green and locks into place. When this happens, the filter element needs cleaning. To reset it, press the top of the gage (1).

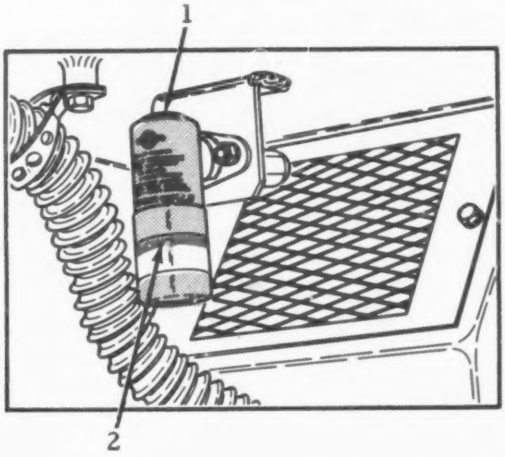


Figure 3-17. Air cleaner filter restriction gage.

3-34. Servicing.

a. Air Intake Screen. Clean away any dirt or mud that is restricting the free flow of air through the air intake screen (fig. 3-18).

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WARNING

NBC contaminated filters must be handled using adequate precautions (FM 21-40) and must be disposed of by trained personnel.

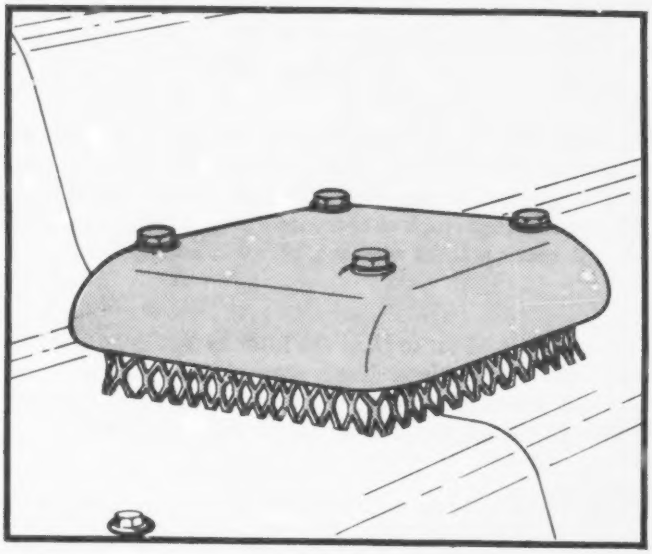

Figure 3-18. Air intake screen.

b. Dust Cover. The air cleaner dust cover must be removed and cleaned daily or more often as required. Be sure the filter wingnut (6, fig. 3-19) is tight each time you remove the dust cover. Open dust cover cap, clean out dust, wipe with a clean, damp cloth and replace. See figure 3-19.

c. Filter Element. When the restriction gage window is completely red, the filter element must be removed and cleaned or replaced. See figure 3-19 for cleaning instructions.

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d. In An Emergency:

CAUTION

Do not rap the filter against a hard surface. This will dent the element and damage the seals.

NOTE

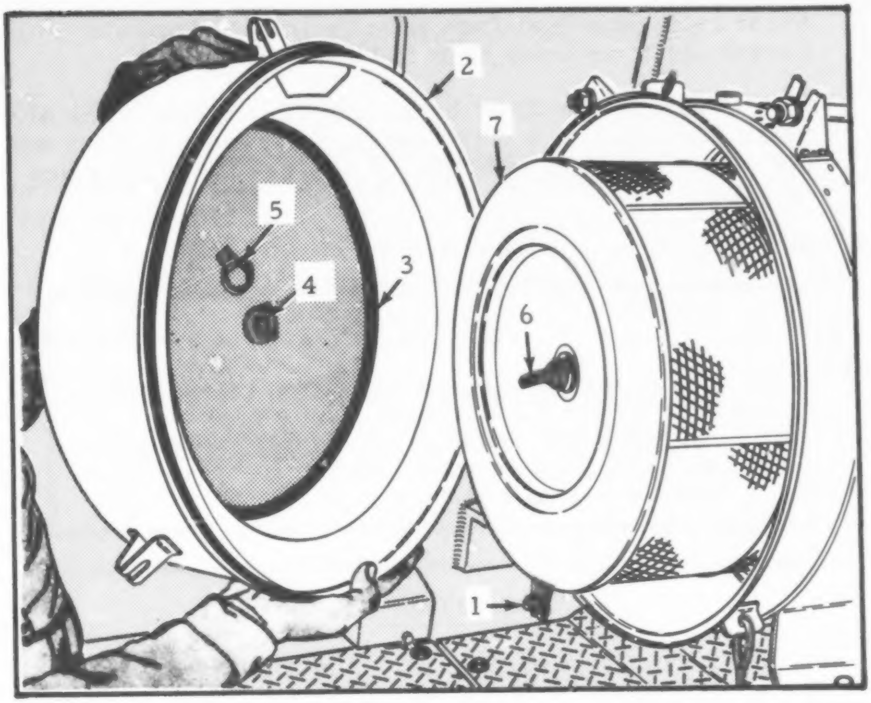
The filter will not be washed more than 2 times. Too much washing will destroy the paper element. Each time you wash the filter scribe the date into the metal base of the filter. This way you can keep track of how many times it has been washed. When it needs a third washing, throw it away.

NEVER use compressed air to clear the filter except in an EMERGENCY. If you have to, use 100 psi or less. Use a lower pressure source if possible. High pressure air (100 psi) might rip the element and allow dirt to enter the engine. This will damage the engine. Never use air on a wet filter.

e. Inspection.

(1) Inspect the filter by shining a light from the inside out. If the smallest tear or hole is discovered, replace the filter immediately.

(2) Have all damaged seals replaced immediately.



1. Loosen and pull away 4 wingnut clamps (1) from dust cover (2).

2. Remove dust cover baffle (3) by removing wingnut (4) and pulling ring (5). Clean dust cover with a water-damp cloth.

3. Unscrew filter element wingnut (6) and remove filter (7).

4. Rinse away dust from filter element with clean water at no more than 10 psi.

5. Soak filter in lukewarm water using a nonfoaming detergent for 15 minutes. Do not use solvents, fuel oils or gasoline.

6. Shake filter slightly before removing from water.

7. Rinse with clean water (low pressure) from inside out.

TA171244

Figure 3-19. Main engine air filter maintenance (Sheet 1 of 2).

8. Set it aside in a dust-free area to dry or circulate heated air at no more than 150°F.

9. Before putting the filter back, wipe the inside of the air filter housing with a clean water-damp cloth and inspect the filter for tears or holes. If any are found, replace the filter.

10. Reinstall filter and hand tighten wingnut.

CAUTION

ONLY in an emergency, use compressed air of 100 psi or less. Blow dust from inside out. Hold nozzle NO CLOSER THAN 1 INCH from metal cover so you do not tear the paper. If filter is torn, dirt will enter the engine and damage it.

CAUTION

DO NOT rap filter to clean it. You might damage the seals and allow dirt to enter the engine.

CAUTION

DO NOT wash the filter more than 2 times. When it is due for a third washing, replace it.

TA038864

Figure 3-19. Main engine air filter maintenance (Sheet 2 of 2).

Section XI. WELDING EQUIPMENT MAINTENANCE

3-35. General.

Your maintenance of this equipment consists of removal and installation of the oxygen and acetylene cylinders and regulator valves.

3-36. Oxygen Cylinder and Regulator Valve Installation.

See figure 3-20.

3-37. Acetylene Cylinder and Regulator Valve Installation.

See figure 3-21.

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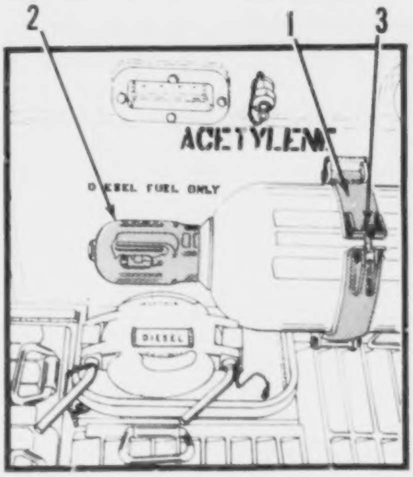
CAUTION

Cap oxygen bottle when gages are detached. Keep fittings clean at all times.

1. To install cylinder:
   - a. Lay cylinder between 2 strap assemblies (1).
   - b. Rotate cylinder so valve outlet (inside cap) is pointing up.
   - c. Tighten nut (3) on strap assemblies to secure cylinder.



NOTE

Be sure safety cap (2) is on cylinder when installing or removing.

2. To install regulator valve:
   - a. Position gages (1) on regulator so you can read them easily.
   - b. Aline valve fitting to cylinder outlet and tighten nut (2).
   - c. Operation instructions for regulator are found in TM 9-237.

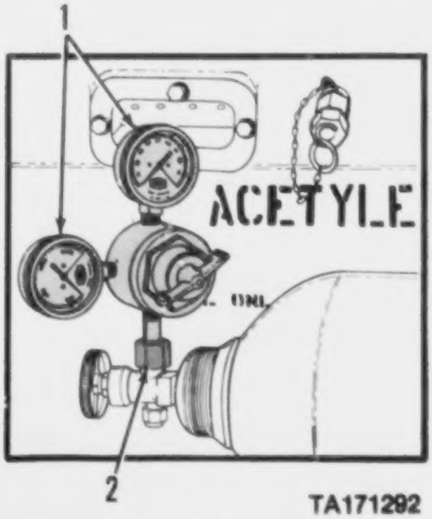


Figure 3-20. Oxygen cylinder and regulator valve installation

1. To install cylinder:

   a. Unhook top rear of hinge assembly (1) and swing it away from door.

   b. Open stowage cabinet door and remove screws and lock washers (2) from brackets (3). Remove brackets.

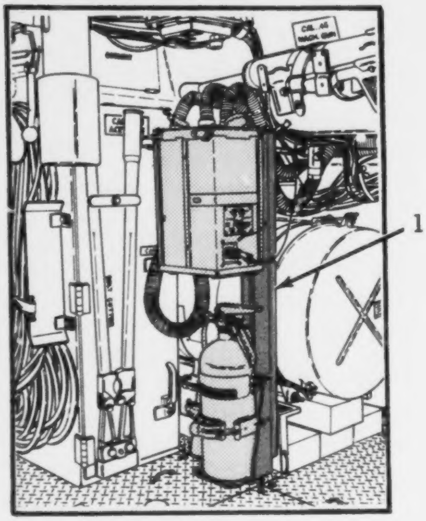
   c. Put acetylene cylinder (4) in cabinet and remove safety cap (8). Aline valve outlet (5) with hull outlet tube (6). Tighten nut (7).

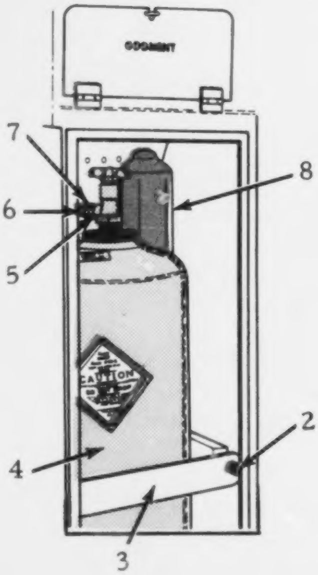
   d. Replace bracket, screws and washers and close door.

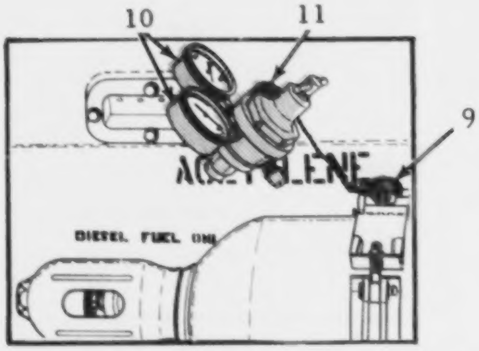
2. To install regulator valves:

   a. Remove hull outlet fitting plug (9).

   b. Position gages (10) so they can be easily read.







   c. Tighten nut (11).

   d. Operation instructions for regulator are found in TM 9-237.

Figure 3-21. Acetylene cylinder and regulator valve installation.

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Section XII. MAINTENANCE UNDER UNUSUAL CONDITIONS

3-38. General.

a. Special care in cleaning and lubricating the vehicle must be taken where extremes in temperature, humidity, and terrain conditions exist. Good care of the vehicle insures proper operation and functioning. It also guards against excessive wear of the working parts and deterioration of the materiel. Approved storage and handling instructions for lubricants and fuels should be followed.

b. Refer to LO 9-2350-256-12 for lubrication instructions. These services should be done often during extremely cold and hot weather, prolonged travel periods, fording, continued exposure to wet or salty air, operation in sand, dust, mud, or for short start-and-stop operating periods. Any one of these conditions may weaken the lubricants.

c. When repeated failure of the materiel results from exposure to extreme conditions, report the problem on DA Form 2404 and notify organizational maintenance.

3-39. Extreme Cold Weather Maintenance-Vehicle.

NOTE

Make frequent inspections of inactive vehicles.

a. Batteries. Extreme cold causes batteries to freeze and prevents them from furnishing enough power for engine starts. TM 9-207 gives information about the effects of cold weather on batteries. Remove batteries from vehicle and store them in a warm place whenever the vehicle is not in use for long periods.

b. Tracks and Suspension. Park the vehicle on a footing of planks or brush to prevent tracks from freezing to ground. Chock if necessary. Clean mud, snow, and ice from the tracks and suspension as soon as possible. Refer to TM 9-207 for the effects of cold weather on the tracks and suspension.

c. Canvas Covers and Tarpaulins. Canvas covers and tarpaulins are hard to use in cold weather. Whenever possible tarpaulins should be warmed and unfolded in heated areas. Clean the vehicle of snow, ice, and mud before covering. Cover and shield the vehicle, but keep the ends of the cover off the ground to prevent them from freezing. Always cover the rear deck of the vehicle to keep snow out of the engine compartment.

d. Metal Parts. Metal parts become more brittle and cannot take shock loads at arctic temperatures. Make frequent inspections of metal areas. Remove corrosion from exterior metal surfaces with abrasive paper or cloth and apply a protective coating of paint, oil, or suitable rust preventive.

e. Plastic and Rubber Parts. Any parts made of plastic or rubber materials must be handled carefully. These become brittle in cold weather and may break due to vibration or handling. To prevent insulation from cracking and causing short circuits, warm rubber or plastic insulated cables before bending and be sure all cables are secure in the vehicle.

3-40. Extreme Cold Weather Maintenance-Armament.

a. Keep bore of machinegun and firing mechanism covered when not in use to prevent entrance of snow.

b. Clean the bore of the machinegun while barrel is still warm, if possible.

c. The recoil mechanism may stick unless it is exercised frequently. Refer to FM 23-65 or TM 9-1005-213-10 for methods of exercising.

CAUTION

Severe damage to the weapon might result if the recoil mechanism is frozen.

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3-41. Extreme Cold Weather Maintenance-Vision Devices.

Vision devices should not be exposed to sudden changes in temperature. Equipment used outside at low temperatures should stay outside to avoid fogging.

3-42. Extreme Hot Weather Maintenance.

a. Batteries.

(1) Electrolyte level. In hot climates, have electrolyte level checked daily.

(2) Specific gravity. Batteries should have a weaker electrolyte in hot areas (1.200 to 1.225 at full charge). Have specific gravity level checked.

(3) Self-discharge. A battery will self-discharge faster if left standing for long periods in high temperatures. If the vehicle is parked for several days, remove the batteries and store in a cool place.

NOTE

Do not store acid-type storage batteries near stacks of tires. The acid fumes will deteriorate rubber.

b. Hull and Cab.

(1) In hot, damp areas, corrosion will occur on all parts of the materiel. It will appear as rust and paint blisters on metal surfaces and mildew, mold, or fungus growth on fabrics and glass.

(2) Protect all unfinished, exposed metal surfaces with a film of preservative lubricating oil (medium). Cables and terminals should be protected by ignition insulation compound.

(3) Frequently inspect inactive vehicles. Remove corrosion from exterior with abrasive paper or cloth and apply a protective coating of paint, oil, or suitable rust preventive.

c. Armament. Inspect parts often for moisture or corrosion. Thoroughly dry all exposed, unpainted surfaces such as bore, breech, and firing mechanisms and oil as prescribed in TM 9-1005-213-10. In dry, dusty, or sandy areas, leave exposed surfaces dry, such as the recoil slides. Combining the oil with sand makes an abrasive paste far more damaging than no oil at all. At other times, keep these surfaces lubricated to prevent rusting.

d. Vision Devices. Inspect parts for moisture, corrosion, or fungus growth. In dry, dusty, or sandy areas keep exposed optical surfaces protected from blowing sand.

3-43. Maintenance of Vehicle after Fording.

a. General. Although the vehicle housings are sealed to prevent leakage, water may enter, especially during submersion. The following services should be done on all vehicles exposed to partial or complete submersion, especially in salt water.

(1) Hull and Cab. Drain and clean hull. Clean all exposed surfaces and touch up with paint where necessary. Coat unpainted metal parts with preservative lubricating oil.

(2) Engine and Transmission. Check the lubricant in the engine and transmission. Drain, flush, and refill the item with the correct lubricant. Refer to LO 9-2350-256-12.

(3) Suspension. Clean and lubricate all parts as specified in LO 9-2350-256-12. Force lubricant generously into each lubrication fitting to force out any water.

(4) Batteries. Check the batteries for level of electrolyte to be sure that no water entered through the vent caps. This is important if the vehicle was submerged in salt water.

(5) Electrical Connections. Check all electrical connections for corrosion.

(6) Fuel System. Drain fuel tanks of any accumulated water.

(7) Air Cleaners. If water is found in the air cleaner, clean and dry the filter element (fig. 3-19).

(8) Condensation. The sudden cooling of the warm interior air upon submersion might cause condensation of moisture within instruments. A period of exposure to warm air after fording should eliminate this condition.

(9) Vision Devices. If moisture has entered optical instruments, turn them in to organizational maintenance for repair at the earliest opportunity.

b. Deep-water Fording. Refer to TM 9-238 for deep-water fording information.

3-44. Maintenance of Armament after Fording.

a. General. During fording operations, water seepage to lubricated parts will occur. The following services will be done on all weapons which have been exposed to water.

(1) Perform authorized lubrication services (TM 9-1005-213-10 for caliber .50 machinegun).

(2) Assemblies which require disassembly for proper lubrication must be torn down, dried, and lubricated as soon as possible.

(3) Notify organizational maintenance personnel so that complete disassembly, cleaning, and lubrication can be accomplished as soon as possible.

b. Cleaning and Lubrication. Drain or wipe dry all trapped moisture. Clean all exposed unpainted parts and coat with the preservative lubricating oil prescribed in the lubrication order.

(1) Bore. Wipe dry and oil with lubricant. If any mud or grit has washed into the bore, clean with rifle-bore cleaner, wipe dry, and oil with lubricant.

(2) Breech and Firing Mechanism. Completely disassemble and clean all parts with drycleaning solvent or mineral spirits paint thinner. Wipe dry and oil all parts as prescribed in the lubrication order.

3-45. Maintenance of Vehicle After Operation On Unusual Terrain.

a. Mud. Clean and lubricate all parts as soon as possible after operation in mud (LO 9-2350-256-12).

b. Sand or Dust. Clean engine and engine compartment. Touch up all painted surfaces damaged by wind-blown sand. Lubricate completely to force out any sand or dust. Air cleaner dust covers must be cleaned daily. Oil coolers should be cleaned daily with compressed air. Notify organizational maintenance to check and clean fuel oil filters.

CHAPTER 4

MATERIEL USED WITH THE VEHICLE

Section I. COMMUNICATION SYSTEM

4-1. General.

The communication equipment installed in the M88A1 is for internal and external communications. This section describes the equipment and gives basic operating instructions.

> CAUTION
>
> Turn radios OFF before starting the main engine or the APU.

4-2. Intercommunication Set AN/VIC-1 (V).

a. Description. This equipment provides communications between the crew during operations. It consists of the following:

(1) Control box C-2298/VRC - one for each crew position.

(2) Amplifier AM 1780/VRC.

b. Amplifier Operation. See figure 4-1.

c. Control Box and CVC Helmet Operation. See figure 4-2.

4-3. Radio Sets.

a. General. The M88A1 will be supplied with the AN/VRC-44, AN/VRC-46 or the AN/VRC-64 radio communications system. They provide external communication capabilities.

b. Radio Equipment and Suppressor. Refer to figure 4-3 for location of radio equipment on the vehicle. Operating instructions for the suppressor MX-7778A/GRC and the X-mode equipment TSEC/KY-38 are also given.

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c. Radio Operation. Figure 4-4 gives operating instruction for the following:

(1) RT-246A/VRC transmitter and R-442A/VRC receiver (AN/VRC-44 radio set).

(2) RT-524/VRC transmitter (AN/VRC-46 radio set).

(3) RT-841/PRC-77 and OA-3633/GRC receiver transmitter (AN/VRC-64 radio set).

See paragraph 4-5 for more detailed information on the operation of the radio equipment supplied with the M888A1.

d. Removal and Installation.

CAUTION

ALWAYS set vehicle MASTER switch to OFF before installing or removing radio or intercom equipment.

(1) Disconnect all cables from equipment being used.

(2) Loosen latching thumbscrews on front of mount.

(3) Pull equipment out from mount.

(4) Reverse procedures for installation.

4-4. Operator's Maintenance Instructions.

a. General. Preventive-maintenance checks and services will be done daily on all radio and intercommunication equipment. This maintenance will also be done when:

(1) Equipment is first installed.

(2) Equipment is reinstalled after removal for any reason.

(3) At least once a week if equipment is in standby condition.

b. Preventive Maintenance Checks and Services. Refer to table 3-1 for checks and services to be performed daily.

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c. Cleaning.

(1) Inspect the outside surfaces of the equipment for dirt, grease, dust and fungus.

(2) Remove dust, fungus and loose dirt on the cases and connectors with a soft, clean cloth or brush.

(3) Use drycleaning solvent or mineral spirits paint thinner on a cloth to remove grease and dirt from cases.

WARNING

Keep all doors and hatches open when using drycleaner solvent or mineral spirits paint thinner. The fumes are toxic. Do not use near open flame.

(4) Clean the front panels and knobs with a soft clean cloth. If dirt is hard to remove, dampen cloth with water. Use a mild soap if necessary.

4-5. References.

Refer to the following for further information on the radio and intercommunication equipment supplied with the M88A1:

a. TM 11-5820-401-12 for radio sets AN/VRC-44 and AN/VRC-46.

b. TM 11-5820-498-12 for radio set AN/VRC-64.

c. TM 11-5830-340-12 for intercommunication set AN/VIC-1 (V).

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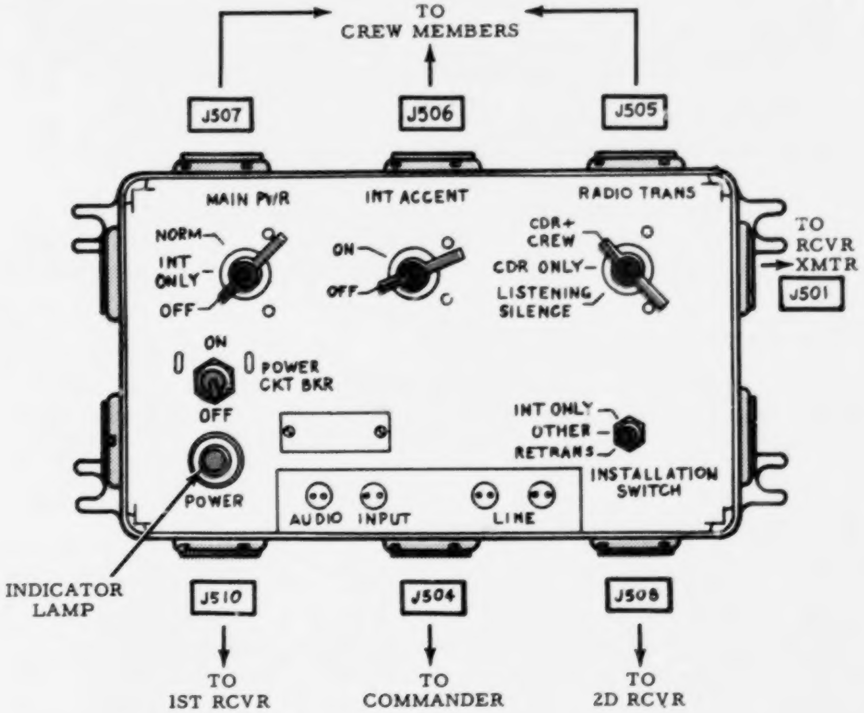
CAUTION

BEFORE you operate Intercom or Radio, ALWAYS:

1. Set vehicle MASTER switch to ON (1, fig. 2-5, Sheet 7).
2. Set Suppressor, MX-7778A/GRC, to ON (1, 2, fig. 4-3).
3. Set Amplifier, AM 1780/VRC switches as shown below.


TO
CREW MEMBERS
J507
J506
J505
MAIN PWR
NORM
INT ONLY
OFF
INT ACCENT
ON
OFF
RADIO TRANS
CDR+ CREW
CDR ONLY
LISTENING SILENCE
TO RCVR XMTR
J501
ON
POWER CKT BKR
OFF
POWER
INT ONLY
OTHER
RETRANS
INSTALLATION SWITCH
AUDIO
INPUT
LINE
INDICATOR LAMP
J510
J504
J508
TO 1ST RCVR
TO COMMANDER
TO 2D RCVR

1. Set MAIN PWR switch to NORM.
2. Set POWER CKT BKR to ON. The POWER lamp should light. If POWER CKT BKR trips OFF, reset it to ON.

TA038925

Figure 4-1. Amplifier AM 1780/VRC operation (Sheet 1 of 2).

CAUTION

If POWER CKT BKR trips again, set MAIN PWR to OFF and notify organizational maintenance.

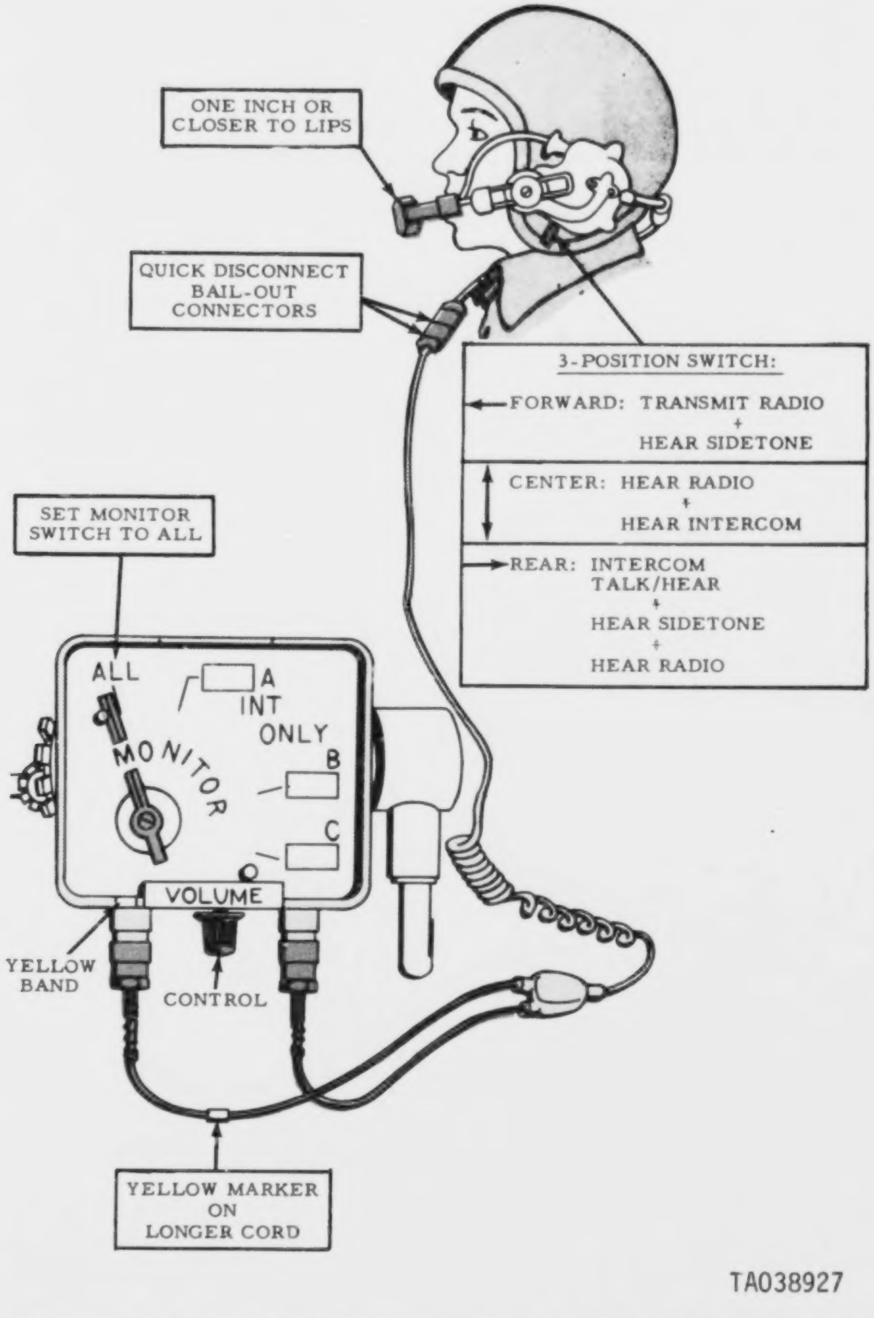
3. Set the other switches to the positions shown on the preceding page.

NOTE

INT ACCENT-OFF: Intercom and Radio sound levels are equal.
INT ACCENT-ON: Radio sound level is lower than Intercom.

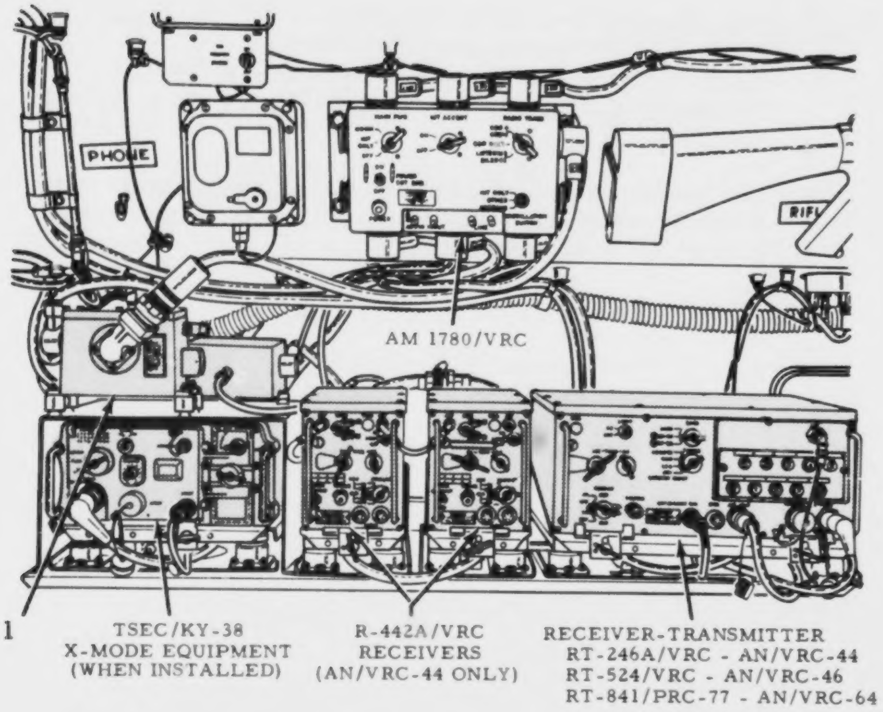
TA038926

Figure 4-1. Amplifier AM 1780/VRC operation (Sheet 2 of 2).

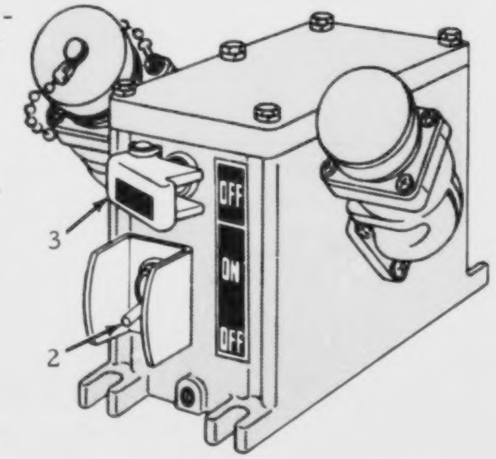

ONE INCH OR CLOSER TO LIPS
QUICK DISCONNECT BAIL-OUT CONNECTORS
3-POSITION SWITCH:
FORWARD: TRANSMIT RADIO + HEAR SIDETONE
CENTER: HEAR RADIO + HEAR INTERCOM
REAR: INTERCOM TALK/HEAR + HEAR SIDETONE + HEAR RADIO
SET MONITOR SWITCH TO ALL
ALL
A
INT ONLY
MONITOR
B
C
VOLUME
YELLOW BAND
CONTROL
YELLOW MARKER ON LONGER CORD

TA038927

Figure 4-2. Control, Intercom Set C-2298/VRC and CVC Helmet connection and operation.


PHONE
RIFL
AM 1780/VRC
1
TSEC/KY-38
X-MODE EQUIPMENT
(WHEN INSTALLED)
R-442A/VRC
RECEIVERS
(AN/VRC-44 ONLY)
RECEIVER-TRANSMITTER
RT-246A/VRC - AN/VRC-44
RT-524/VRC - AN/VRC-46
RT-841/PRC-77 - AN/VRC-64

1. To operate the suppressor MX7778A/GRC (1):
   a. Turn vehicle MASTER switch ON.
   b. Turn circuit breaker switch (2) ON.
   c. If switch trips OFF because of overload, reset it. If it keeps tripping OFF, call organizational maintenance.
   d. If switch (2) can't be reset, use BATTLE OVERRIDE switch (3) in an EMERGENCY only. The radios are unprotected when this switch (3) is used.


OFF
ON
OFF
3
2

TA038928

Figure 4-3. Component location - all radio sets and Suppressor MX-7778A/GRC operation (Sheet 1 of 2).

2. X-Mode Operation (TSEC/KY-38).

   a. When X-mode equipment is used the X-MODE-NORMAL switch inside the radio is set to X-MODE position.

   b. The radio operating procedures in association with X-mode equipment are given in the publication provided with the equipment.

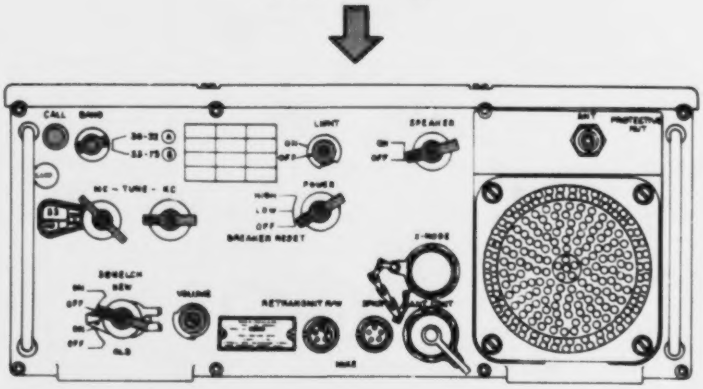
TA038929

Figure 4-3. Component location - all radio sets and Suppressor MX-7778A/GRC operation (Sheet 2 of 2).

I. Operation of: AN/VRC-44 (RT-246A/VRC and R-442A/VRC), AN/VRC-46 (RT-524/VRC).

STEP	CONTROL	SETTING
1	SQUELCH	NEW-OFF.
2	LIGHT	ON (OFF during blackout).
3	POWER	ON-RESET or LOW (Reset to ON or LOW if it trips OFF).
4	VOLUME	Set to hear rushing noise.
5	BAND	A for 30.00 to 52.95. B for 53.00 to 75.95.
6	MC-TUNE	Set first two channel numbers.
	KC-TUNE	Set last two channel numbers.
7	(TRANSMIT)	Wait one minute after POWER-ON. To transmit, hold CVC Helmet switch forward (fig. 4-2).
	(RECEIVE)	To receive, release CVC switch.
	VOLUME	Set to comfort level.
8	POWER	OFF to turn radio off.

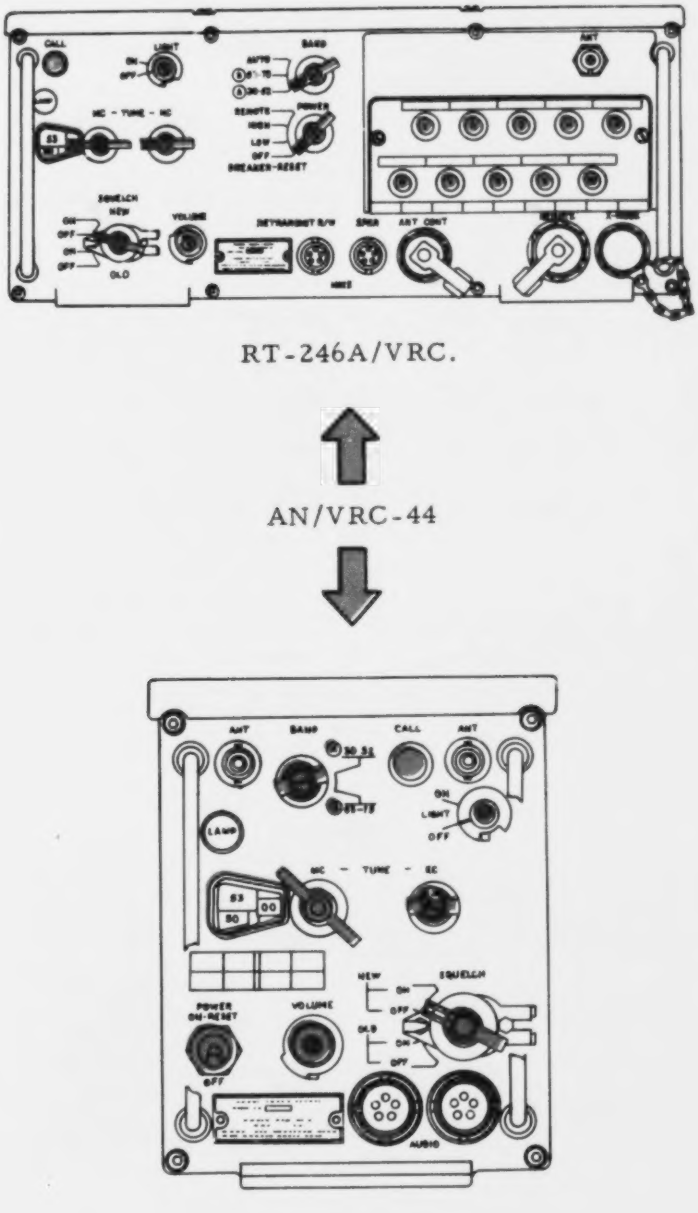
AN/VRC-46


CALL
BAND
30-52 A
53-75 B
LIGHT
ON
OFF
SPEAKER
ON
OFF
ANT
PROTECTIVE NUT
MC - TUNE - KC
POWER
HIGH
LOW
OFF
BREAKER RESET
X-MODE
SQUELCH
NEW
ON
OFF
ON
OFF
OLD
VOLUME
RETRANSMIT R/W
MIKE

RT-524/VRC.

TA038930

Figure 4-4. Radio operation (Sheet 1 of 4).

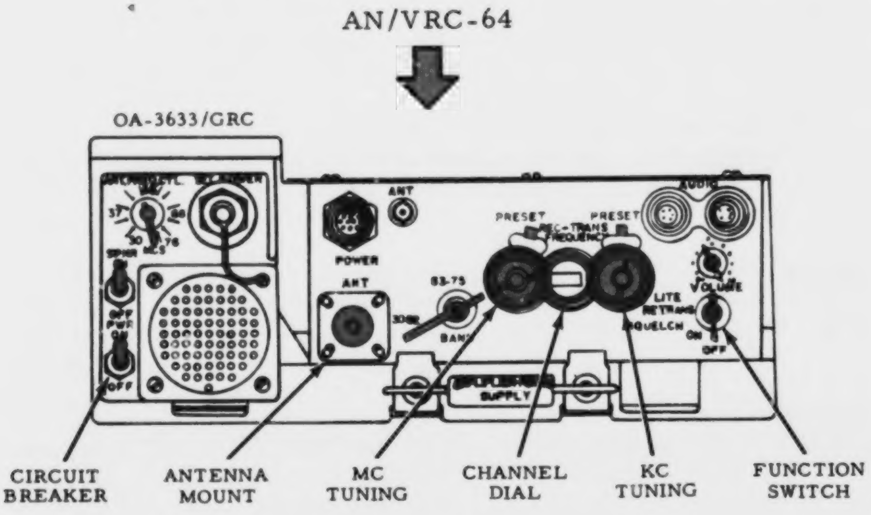

RT-246A/VRC.
CALL
LIGHT
ON
OFF
BAND
POWER
BREAKER-RESET
SQUELCH
NEW
OLD
VOLUME
ANT
ANT CONT
AN/VRC-44
R-442A/VRC.
ANT
BAND
CALL
ANT
ON
LIGHT
OFF
LAMP
TUNE
NEW
SQUELCH
POWER ON-RESET
VOLUME
OLD
OFF
AUDIO

TA038931

Figure 4-4. Radio operation (Sheet 2 of 4).

II. Operation of: AN/VRC-64 (RT-841/PRC-77 and OA-3633/GRC).

STEP	CONTROL	SETTING
1	FUNCTION SWITCH	ON.
2	PWR	ON (Reset to ON if it trips OFF).
3	BAND	30-52 or 53-75.
4	MC TUNING	Set first two channel numbers.
	KC TUNING	Set last two channel numbers.
5	VOLUME	Set to hear rushing noise.
6	ANT. FREQ. CONTROL	Set to position that includes operating frequency (channel).
7	(TRANSMIT)	Wait one minute after PWR-ON. To transmit, hold CVC Helmet switch forward (fig. 4-2).
	(RECEIVE)	To receive, release CVC switch.
	VOLUME	Set to comfort level.
8	FUNCTION SWITCH and PWR	Both OFF (to turn radio off).


AN/VRC-64
OA-3633/GRC
CIRCUIT BREAKER
ANTENNA MOUNT
MC TUNING
CHANNEL DIAL
KC TUNING
FUNCTION SWITCH

RT-841/PRC-77

TA038932

Figure 4-4. Radio operation (Sheet 3 of 4).

III. General:

1. The CALL lamp indicates a signal being received. CALL lamp operates only when LIGHT and SQUELCH are both ON.

2. Use HIGH transmit power only when LOW does not permit good communication. If radio POWER circuit breaker trips off on HIGH operation but will hold on LOW, reset it, operate on LOW and notify organizational maintenance.

3. SPEAKER or SPKR switch is usually OFF. Speaker can be used (ON) when main engine is stopped.

4. Squelch. Always establish good 2-way communications with SQUELCH set to NEW-OFF or with the function switch (AN/VRC-64) set to ON. Then try to establish squelch operation. Squelch stops the receiver background or rushing noise. Squelch can also kill 2-way communications unless both stations are set on NEW-ON or SQUELCH. If in doubt or if you have trouble using squelch, operate with SQUELCH set to NEW-OFF or function switch set to ON.

TA038933

Figure 4-4. Radio operation (Sheet 4 of 4).

Section II. DEEP WATER FORDING KIT

4-6. General Description.

a. The deep water fording kit is designed to permit the M88A1 to operate in water up to 102 inches (8ft. - 6in.) deep.

b. The kit provides equipment and sealing materials for the hull, fuel fill cap, APU, personnel heater and main engine air inlets, APU exhaust, main engine generator exhaust, outside fire extinguisher pull handles, nozzles, acetylene vent, stowage compartment and personnel doors against the entry of water while fording. It will be installed and checked by organizational maintenance with your help.

c. The design of the deep water fording equipment permits the vehicle to be completely operable on land or in water.

4-7. Equipment Description.

a. Main Engine Exhaust. The main engine exhaust system uses pipes for venting the main engine exhaust. Two flexible, bellowed-type pipes are clamped and sealed to the main engine exhaust pipes which remove the exhaust gases through the rear engine deck hoods. Four clamps bolted to the engine deck are used to hold the system in proper position.

b. Main Engine Air Inlet. The main engine air inlet system provides air for the main engine. The system has two pipes and two rubber seals, which cover each of the air intake vents on the top of the vehicle cab.

c. Main Engine Generator Cooling Air Exhaust System Adapters, flexible tubing, and an exhaust pipe provide an exhaust outlet for the generator so it can be operated while fording.

d. Auxiliary Power Unit Generator. Preparations and precautions are taken before and after submersion of the APU to prevent corrosion and destruction of leads and generator parts due to exposure to salt water and sand. A sealer plug is used to cover the APU exhaust outlet.

CAUTION

The APU cannot be turned on during fording operations.

e. Personnel Heater Air Inlet and Exhaust.

CAUTION

Personnel heater cannot be turned on during fording operations.

Personnel heater air inlet and exhaust must be plugged for fording operations and must be unplugged after fording.

f. Acetylene Compartment Vent. A vent assembly consisting of tubing, fittings, adapter plate, and gasket is attached to a boss which surrounds the four vent holes in the left rear of the cab. It provides ventilation of the compartment during the deep water fording operation. Two clips mounted on the left main engine air intake pipe support the vent system.

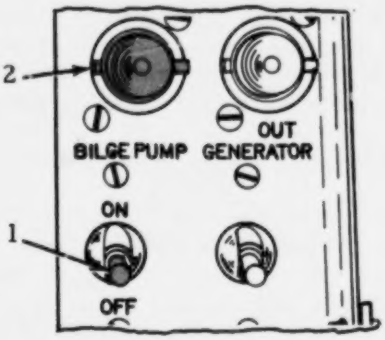
g. Fuel Tank Vent. Two 90-degree elbows, a rubber hose, two hose clamps, a seal, and a clip are used to seal and vent the left fuel tank fill area.

h. Bilge Pump, Motor and Support Assembly.

(1) A bilge pump with motor and support assembly will be installed on the hull floor in the hydraulics compartment with the deep water fording kit. The pump is used to remove any water which might enter the compartment during fording. The discharge of the pump goes through the bilge pump hose to an outlet adapter mounted on the right side of the personnel compartment. The hose and nozzle assembly can be attached to the outlet adapter to wash down the vehicle after fording.

TA038934

(2) A toggle switch (1) and indicator lamp (2) for operating the pump are located on the accessories panel.



(3) A relay, which is activated by the toggle switch, controls the pump motor. A circuit breaker provides overload protection for the pump circuit. The switch and relay coil circuit is protected by a circuit breaker in the accessories panel.

i. Ventilating Blower Housing and Boom Foot Drains. A sealing plate fits into and seals the ventilating blower air duct housing. Hose shutoff clamps are used to cut off water flow from the ventilating blower air duct housing and boom foot drains.

j. Fire Extinguisher System. Seven rubber fire extinguisher nozzle caps stop water and contaminants from entering the extinguisher system. These caps are not sealed and can be blown off the nozzles if the system is needed during fording.

k. Sealing the Taping Materials.

(1) Apply waterproof tape around the transmission oil filler neck and large open areas where required.

(2) Fording sealer is used as a sealing compound around exterior stowage compartment and personnel doors, main winch cable openings, around nose piece, and all mounting surfaces of vehicle and fording components.

(3) Electrical insulating and sealing compound is used to seal battery terminals, APU generator terminals, main engine generator terminals, and any other electrical connections exposed to water.

TA038935

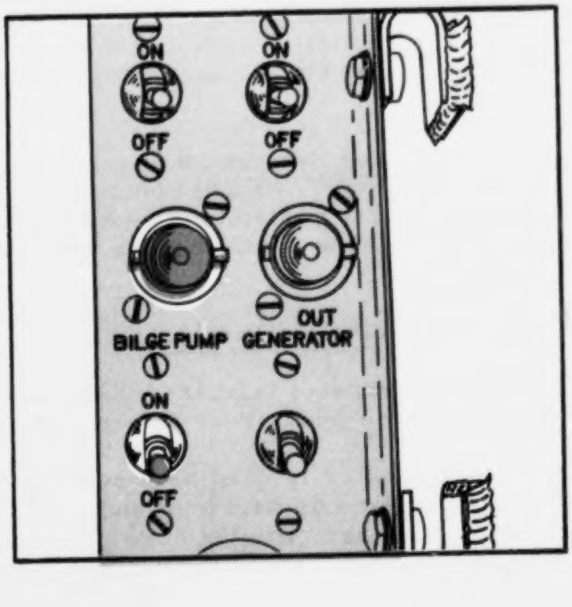
4-8. Inspection of Deep Water Fording Kit Installation.

a. Inspection. Check the kit installation to see that all parts have been installed. Make sure all necessary areas have been sealed or taped and that attaching hardware (screws, clamps) are present and tight. Be sure all equipment removed from vehicle for fording has been properly stowed.

NOTE

If you plan on fording in a sandy area over 56 inches deep for a long time, remove engine compartment hull access plates before you enter the water. This allows the sand to drain out instead of building up and binding controls when you leave the water.

b. Bilge Pump Operation. Check to see that the bilge pump works before you enter the water. Turn the switch ON at the accessories panel (fig. 4-5). The light should come on and there should be no unusual noises from the pump. Turn switch OFF when pump is checked.



TA038936

Figure 4-5. Bilge pump switch and light.

4-9. Operation Instructions.

CAUTION

Check the deepest point of fording area. The maximum depth should not be more than 102 inches including wave height.

a. Engine Operation. Start the engine and check its operation (fig. 2-11 and 2-12). Be sure it runs smoothly and is in top shape.

b. Driving Vehicle While Fording. Have at least one top hatch open. Make sure everything is secure on the vehicle before you enter the water. Shift into 1st gear and enter slowly to avoid forming a bow wave. Keep the engine above 950 rpm to avoid stalling. Keep speed at 3 to 4 mph, using the brake if necessary. Operate bilge pump when it is covered by water. Lift access door (12, fig. 2-9) and turn on winch light (on accessories panel) to help see the pump.

c. Driving in Reverse. If going in reverse is required, stop the vehicle and shift to R. Move back at no more than 3 to 4 mph.

d. Stopping While in the Water. If you have to stop the vehicle while under water, depress the brake, shift to N and keep the engine speed at 950 to 1,000 rpm.

CAUTION

If the engine stalls when under water, restart it immediately using normal starting procedures (fig. 2-11). If it doesn't start, get towed out.

When you can move again, shift to 1st gear and move out slowly at 3 to 4 mph.

e. After-Fording Operations.

(1) If tactical situation permits, stop in shallow water and open drain valves (fig. 2-5, Sheet 2) to allow water to enter the hull.

TA038937

(2) Attach the hose and nozzle assembly (supplied with the kit) to the bilge pump outlet. Operate bilge pump to hose down the vehicle. Wash off sand, mud and salt water. Be sure to flush the APU generator.

(3) Turn off bilge pump when finished and move to dry land to drain hull. Close the drain valves.

(4) Drain all water out of the stowage compartments and hoses.

4-10. Maintenance Instructions.

a. After Fording. Remove all sealer, tape and deep water fording kit components. Reinstall all items removed before fording.

NOTE

If you intend to continue fording, check all fording components for good sealing and tightness.

b. Operate Engines. Operate main engine and auxiliary power unit to get out any moisture which might have seeped in during fording.

c. Lubrication and Painting. Lubricate the vehicle according to LO 9-2350-256-12 immediately after fording. Paint all chipped or exposed surfaces according to TM 9-213 and FM 5-20.

4-11. Troubleshooting the Bilge Pump.

See Table 4-1 for malfunction, cause and corrective action to be taken if bilge pump fails to operate properly.

Table 4-1. Troubleshooting

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

BILGE PUMP

1. BILGE PUMP DOES NOT PUMP WATER

Step 1. Check for a clogged bilge pump inlet.

Remove obstruction from pump inlet. If failure is due to clogged pump inlet screen, notify organizational maintenance.

Step 2. Check for a clogged bilge pump vent.

Remove obstruction from pump vent.

2. BILGE PUMP STARTS AND STOPS WHEN SWITCH IS ON OR FAILS TO OPERATE COMPLETELY

Check for corroded, disconnected or loose harness connections at the switch, circuit breaker or solenoid relay.

Tighten loose connections. If pump failure is due to corroded contacts, notify organizational maintenance.

Section III. M239 SMOKE GRENADE SYSTEM

4-12. General System.

a. Scope. These instructions are for use by the operator and organizational maintenance personnel. They apply to the M239 RP screening smoke grenade launcher. Hereinafter, this equipment will be referred to as grenade launcher.

b. Record and Report Forms.

(1) Equipment maintence forms and procedures for their use are prescribed in TM 38-750.

(2) Use DD Form 6 (Report of Packaging and Handling Deficiencies) to report damage or improper shipment of material.

(3) Report accidents involving injury to personnel or damage to material in accordance with AR 385-40.

(4) Report accidents or malfunctions in combat cr training in accordance with AR 75-1.

(5) Refer to TM 740-90-1, Administrative Storage of Equipment, for administrative storage instructions on the grenade launcher.

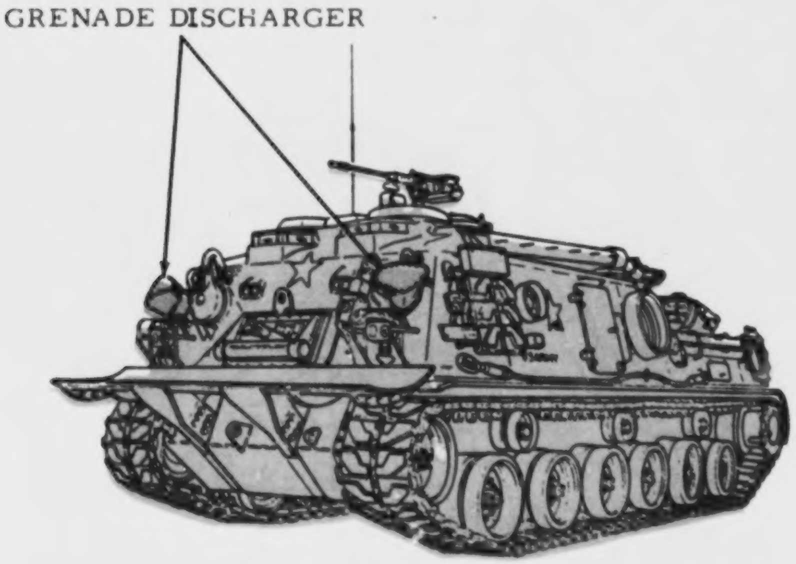
(6) Refer to TM 43-0002-31, TM 9-1300-200, and FM 5-25 for destruction instructions on this grenade launcher.

(7) Refer to TM 43-0139, Painting Instructions for Field Use, for painting instructions on the grenade launcher.

4-13. Description and Data

a. Description.

(1) The grenade launcher provides the M88A1 Recovery Vehicle with a self-screening smoke capability. Twelve smoke grenades, fired in salvo, produce a smoke cloud over a 110 degree arc in two seconds. The cloud is 8-10 meters (26-33 feet) high, 30 meters (98 feet from the vehicle, and lasts one to three minutes depending on wind conditions. The grenade launcher (fig. 4-6) consists of two British No. 9 Mark 1 smoke grenade dischargers with canvas covers, a smoke discharger pushbutton unit, two ammunition storage bins, and an installation kit composed of mounting brackets, an arming switch, electrical wiring harness, and exterior harness protectors.



TA125576

Figure 4-6. M239 smoke grenade launcher (component location).

(2) Each discharger is a six-barreled aluminum casting approximately 10 inches high, 15 inches wide, 18 inches deep, and weighs 33 pounds. One launcher is bolted to a bracket that is mounted on the left outside of the hull (fig. 4-7), the other on the right.

(3) Both dischargers are wired to launch grenades from alternate barrels upon activation of either pushbutton on the smoke grenade discharger pushbutton unit. Activation of one pushbutton will launch six grenades, three from each discharger. Activation of both pushbuttons simultaneously will launch all twelve grenades. The smoke grenade screening pattern is shown in Figure 4-7. 1

NOTE

The discharger marked L. Hand is mounted on right outside of the hull and the discharger marked R. Hand on left outside of hull.

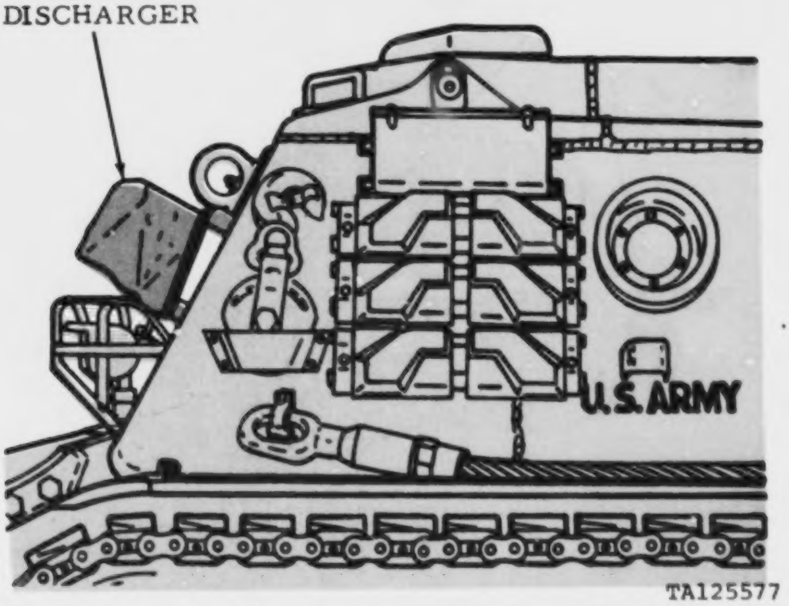


Figure 4-7. M239 smoke grenade launcher-left side.

LEFT DISCHARGER PATTERN	
LEFT	RIGHT
5-2-1	3-6-4

RIGHT DISCHARGER PATTERN	
LEFT	RIGHT
3-6-4	5-2-1

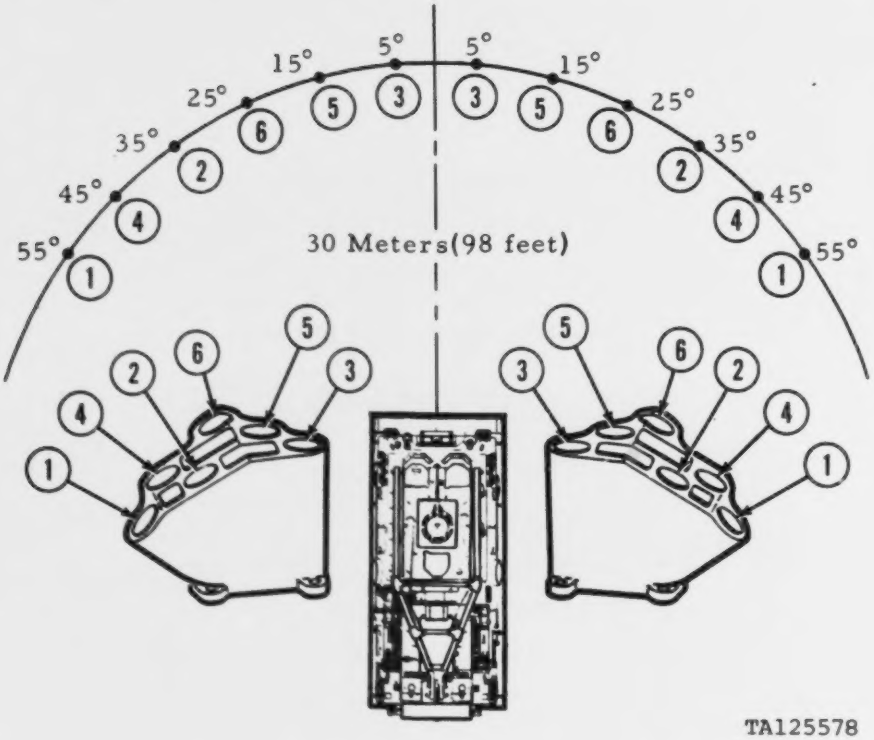

55°
45°
35°
25°
15°
5°
5°
15°
25°
35°
45°
55°
① ④ ② ⑥ ⑤ ③
③ ⑤ ⑥ ② ④ ①
30 Meters(98 feet)
① ④ ② ⑥ ⑤ ③
③ ⑤ ⑥ ② ④ ①
TA125578

Figure 4-7. 1. Smoke grenade launcher screening pattern.

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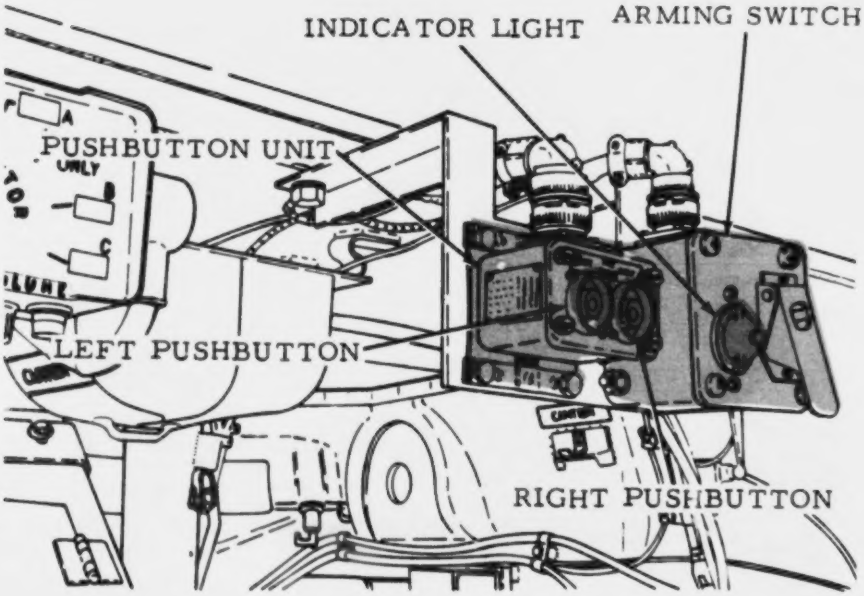
(4) The smoke discharger pushbutton unit (fig. 4-8), mounted on a bracket attached to cabtop, near the commander's cupola has two pushbutton switches that are used to fire grenades from the launcher. An arming switch, mounted next to the pushbutton unit, has a latched toggle switch and an armed light. Electrical wiring harnesses connect the pushbutton unit and arming switch to the dischargers and to the vehicle current source.


INDICATOR LIGHT
ARMING SWITCH
PUSHBUTTON UNIT
LEFT PUSHBUTTON
RIGHT PUSHBUTTON

TA125579

Figure 4-8. Smoke discharger pushbutton unit - arming and firing switch.

(5) Ammunition storage bins (fig. 4-9) are attached outside the vehicle. One bin is bolted to the left front side of the hull, the other to the right. Each bin holds six smoke grenades; one reload for each discharger.

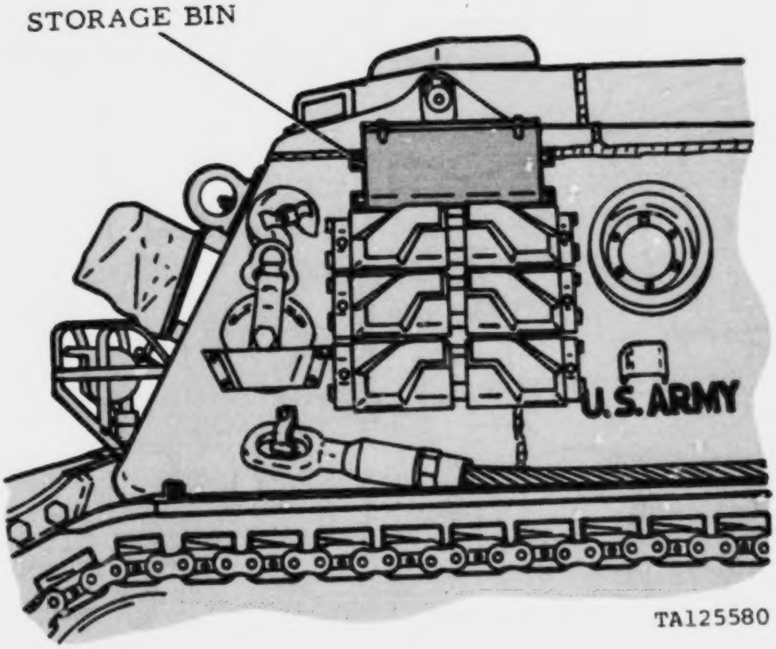


Figure 4-9. Ammunition storage bins.

b. Functional Description. Grenades (fig. 4-10) are fired electrically from the dischargers.

(1) A spring clip in the grenade base engages a tip plug (a bulb-like metal pin) in the bottom center of the discharger barrel.

(2) Six grenades are fired when each pushbutton switch is pushed.

(3) A single barrel cannot be fired.

GREN DSCHGR
SMK SCR L8A1

TA038978

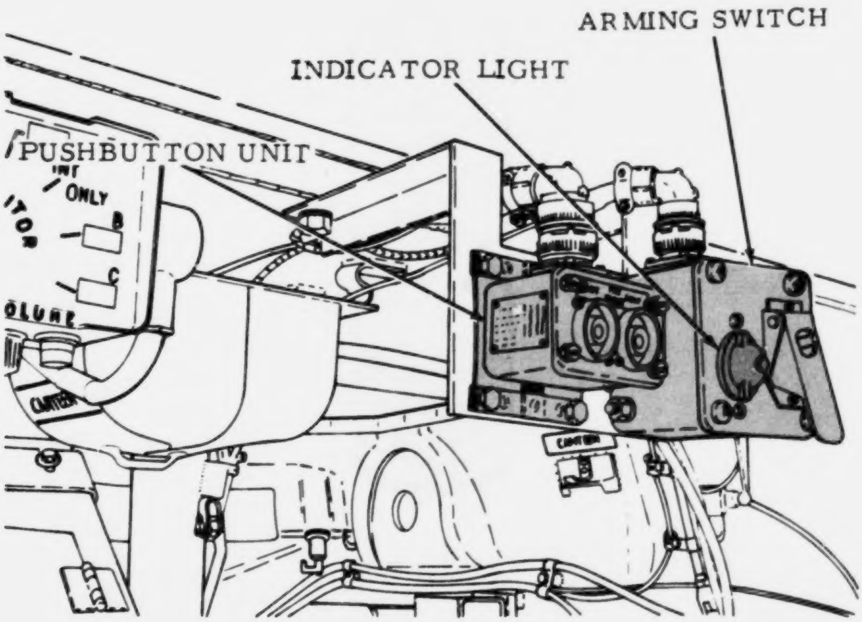
Figure 4-10. UKL8A1 screening smoke grenade.

c. Tabulated Data

Total weight of launchers	200 lb
Weight of one UKL8A1 launcher	1.5 lb

4-14. Controls and Instruments.

A. General. Controls for the grenade launcher consists of a smoke discharger pushbutton unit and an arming switch. An indicator light is the only instrument for the grenade launcher. The controls and instrument are shown in figure 4-11.


ARMING SWITCH
INDICATOR LIGHT
PUSHBUTTON UNIT
ONLY
B
C
CAUTION

TA125581

Figure 4-11. Fire smoke controls and instruments.

b. Controls

(1) Pushbutton Unit

(a) Location. The pushbutton unit is in front of the commander's station.

(b) Purpose. The pushbutton unit has two pushbuttons. One is right and the other is labeled left. They are used to fire the grenades.

(2) ARMING SWITCH

(a) Location. The arming toggle switch is in front of the commander's station.

(b) Purpose. The arming toggle switch is a latched on-off switch that provides power to the pushbutton firing switches.

c. Instruments.

(1) Location (Indicator Light). The armed indicator light is located on the arming switch box.

(2) Purpose. The indicator light is used to show presence of electrical power when lit.

4-15. Operation Under Usual Conditions.

a. Loading.

WARNING

Grenades contain RP that constitutes a fire hazard and danger to all personnel outside the vehicle.

WARNING

Be sure that the arming switch is off (lamp not lit) before loading grenades into a discharger.

WARNING

Never place your body in front of dischargers when loading grenades or when dischargers are loaded.

CAUTION

Follow standard weapon loading procedures when handling and loading grenades.

(1) Be sure that the arming switch is off.

(2) Remove canvas covers and check that barrels are clear and clean.

(3) Remove grenades from six ammunition storage boxes (fig. 4-12).

(4) Place six grenades into each ammunition storage bin on each side of the hull.

(5) Load six grenades in each discharger. Insert grenades, base first, into barrel. Push hard on top of grenade with palm of hand and rotate 1/4 to 1/2 turn while pushing on grenade. This will ensure that the spring clip at the base of grenade is engaged on the pin in the bottom of the barrel of the discharger and assure electrical contact.

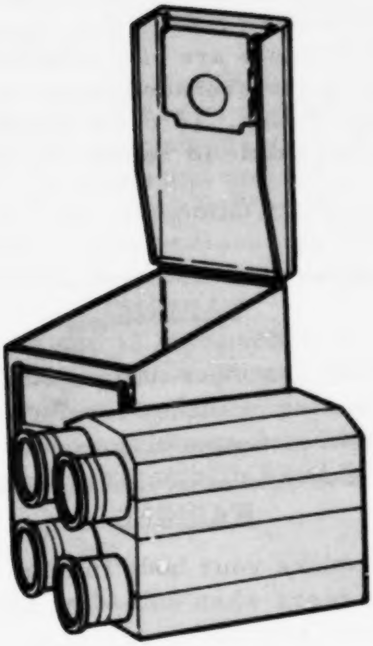


Figure 4-12. Ammunition storage box with grenades.

b. Firing

CAUTION

Firing grenades into strong head wind or while moving rapidly forward should be avoided to the extent possible.

Turn on vehicle master switch. Lift arming switch switch-guard and place arming switch in DOWN position. When power-on lamp is lit, push left, right, or both buttons on grenade launcher pushbutton unit as mission requires.

c. Reloading. Make sure that arming switch is off. Check that all barrels of dischargers are clear. If grenades are still in discharger refer to 4-16. If dischargers are clear, then load the dischargers using the grenades from the two Grenade Stowage Boxes. (A crew member must move outside the vehicle to reload the discharger).

d. Unloading.

WARNING

Be sure that arming switch is off (lamp not lit before unloading grenades from a discharger.

WARNING

Never place your body in front of dischargers when unloading grenades from a discharger.

(1) Remove grenades from dischargers and storage bins.

(2) Return grenades to metal ammunition storage boxes.

(3) Replace canvas covers over the dischargers.

4-16. Operation Under Unusual Conditions.

a. Misfire and Duds.

(1) Misfire. A misfire is the failure of the grenades to be launched from the grenade discharges. When a misfire occurs, make two additional attempts to fire the grenade (Reference 4-15b). If grenade still remains, attempt to fire grenade from another grenade discharger tube. (Reference 4-15a and 4-15b). If grenade remains, treat as dud.

(2) Duds. A dud is a grenade that has either failed to be launched from the grenade discharger or has been launched but failed to burst. Place the dud in an empty storage box (Figure 4-12) as referenced in TM60E-3-2-3 and dispose of duds in accordance with local SOP.

4-17. Maintenance.

a. Cleaning (Weekly).

(1) Clear debris from discharger barrels.

(2) See that drain holes in barrels are clear by inserting a stiff wire.

(3) Clean barrels with rifle bore cleaner, or soap and water as applicable.

NOTE

Do not use wire brush.

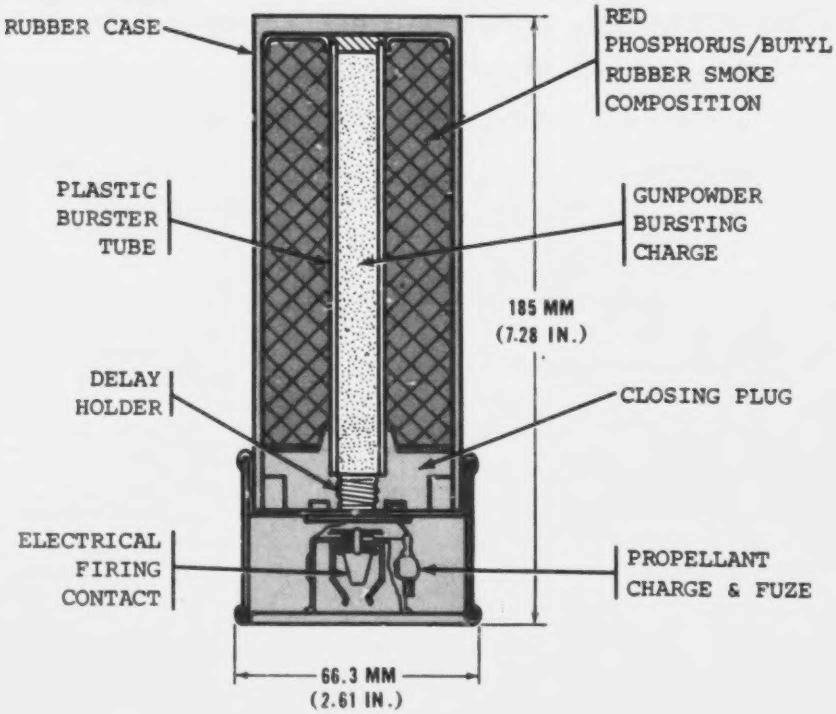
(4) Wipe with a dry cloth. Be sure that no residue remains around the tip plugs which are located at bottom center in each barrel.

(5) Lightly apply lubricant small arms (LSA) to pins in each barrel.

b. Covers. After mission install canvas covers to protect discharger barrels from dust and grit.

4-18. Ammuntion.

a. Description. UKL8A1 RP screening smoke launcher grenades (fig. 4-13) are used with the M239 grenade launcher. They are filled with a red phosphorus and butyl rubber mix. Each grenade is approximately 2-5/8 inches in diameter, 7-9/32 inches long, and weighs approximately 1-1/2 pounds.


RUBBER CASE
RED PHOSPHORUS/BUTYL RUBBER SMOKE COMPOSITION
PLASTIC BURSTER TUBE
GUNPOWDER BURSTING CHARGE
185 MM (7.28 IN.)
DELAY HOLDER
CLOSING PLUG
ELECTRICAL FIRING CONTACT
PROPELLANT CHARGE & FUZE
66.3 MM (2.61 IN.)

TA038984

Figure 4-13. UKL8A1 RP screening smoke launcher grenade (cross section).

b. Function. A grenade is propelled from the discharger when electrical current at the firing contact ignites the fuze. The fuze ignites the propellant charge and a delay composition and, in-turn, the gunpowder bursting charge. This bursts the rubber case and ignites the red phosphorus/butyl rubber composition to produce an immediate smoke cloud.

c. Destruction to Prevent Enemy Usage. Refer to TM 43-0002-31 for destruction of grenades.

4-19. Troubleshooting the Grenade System. See Table 4-2 for malfunction, cause and corrective action to be taken if grenade system fails to operate properly.

Table 4-2. Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

GRENADE SYSTEM

1. SYSTEM OPERATES BUT ARMING LIGHT DOES NOT COME ON

Check lamp.

Tighten or replace as necessary.

2. SYSTEM DOES NOT OPERATE PROPERLY

Inspect all cable harnesses for broken wires or switches.

Tighten all connectors. Notify organizational maintenance.

4-20. Shipment and Storage.

Table 4-3. Shipment and Storage Data for Grenades

Requirements	Designation
Storage Compatability Group	G
Quantity Distance Class	1.4
DOT* Class	Explosive C
DOT* Marking Label	Explosive C
DOT* Marking	Smoke Grenade Handle Carefully Keep Fire Away

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*Department of Transportation

Section IV. EXHAUST SMOKE GENERATING SYSTEM

4-21. General Description.

a. The exhaust smoke generating system provides the M88A1 Recovery Vehicle with a Model AVDS-1790-2DR engine, a self-screening smoke capability. The smoke generating system allows diesel fuel, from the vehicle fuel tanks, to be sprayed into the exhaust system. The fuel vaporizes and exits together with engine exhaust gases. The fuel vapor cools on contact with the ambient air and condenses to form a homogeneous smoke screen.

b. The exhaust smoke generating system consists of solenoid valves, switch assemblies, shut-off valve, indicator light, mounting brackets, fuel hose assemblies, electrical leads, and attaching parts.

c. The solenoid valves and fuel tube assemblies are attached to the rear of the engine. Fuel to operate the smoke generating system is taken from the main fuel supply at the front of the engine.

4-22. Controls.

a. The switch to operate the system is located in the driver's compartment as shown in figure 4-14. Indicator light can be dimmed by turning knurled lens holder.

b. On vehicles which are equipped with the M239 Smoke Grenade System a second switch (figure 4-15) is installed at the commander's station at the left hand side of the commander's grenade switch bracket.

4-23. Operation.

WARNING

Never activate smoke generating system in a building or closed area, or with personnel at the rear of the vehicle.

CAUTION

Do not activate smoke generating system when engine is idling. Engine speed must be at least 1600 rpm.

CAUTION

Always be aware of wind direction and speed when using smoke generator.

CAUTION

After initial operation recheck the system for any possible fuel leaks.

CAUTION

Do not operate smoke generator if vehicle fuel supply is low.

CAUTION

Engine should be run for a minimum of five minutes after smoke system is shut down to clear exhaust.

DRIVER'S COMPARTMENT

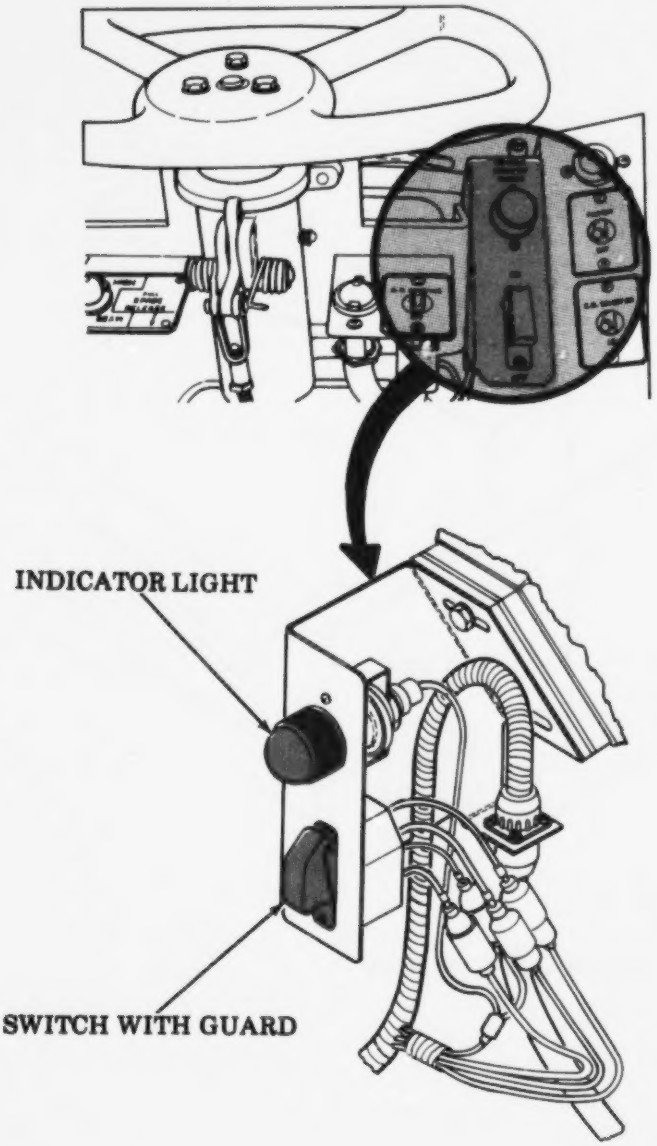
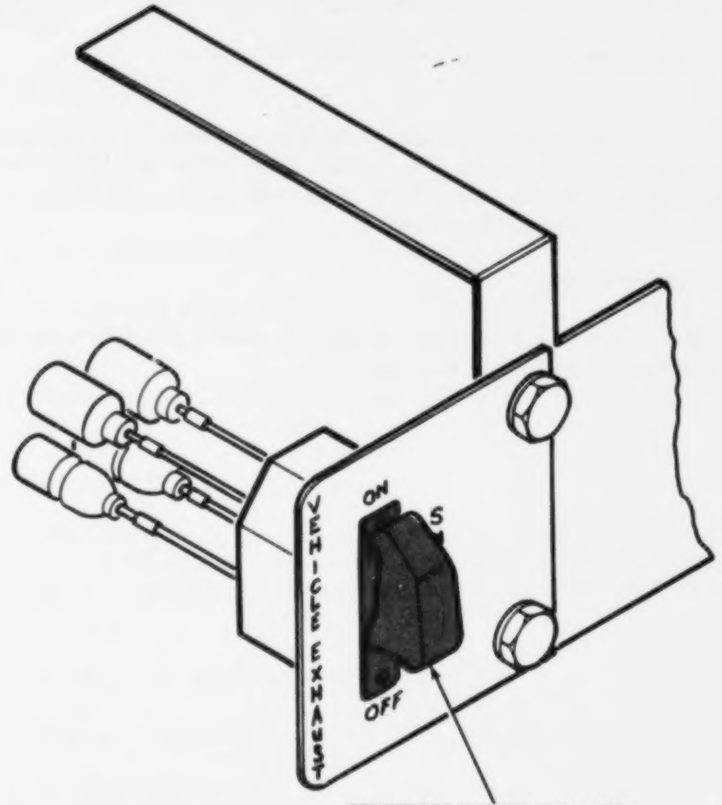

INDICATOR LIGHT
SWITCH WITH GUARD
TA171293

Figure 4-14. Driver's compartment smoke activating switch and indicator light.


VEHICLE EXHAUST
ON
S
OFF
SWITCH WITH GUARD

TA100360

Figure 4-15. Commander's smoke activating switch.

a. Turn on vehicle master switch and warm up engine.

b. Maintain an engine speed of at least 1600 rpm.

c. Activate the smoke generating switch by opening the safety guard and moving the switch to the ON position from either the driver's or commander's areas. The indicator light at the driver's compartment will illuminate when the system is activated.

4-24. Troubleshooting.

See Table 4-4 for troubleshooting the exhaust smoke generating system for malfunction, cause and corrective action.

Table 4-4. Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

1.VEHICLE FAILS TO MAKE SMOKE WHEN ENGINE IS RUNNING AND SMOKE GENERATING SYSTEM IS ACTIVATED

Check fuel shut-off valve.

Should be in open position.

Check generator output to smoke generating solenoid valves.

Notify organizational maintenance of any power malfunction.

Check for fuel running out of hull drains, or mixed with cooling air.

Repair ruptured fuel hose or loose connection. Notify organizational maintenance.

Check solenoid valves.

With engine running, have someone turn smoke generating system switch ON and OFF. Feel solenoid valves to determine if they activate. Notify organizational maintenance of any apparent solenoid malfunction.

Check for voltage at solenoid valves.

Notify organizational maintenance of any lack of voltage.

Check ground connection.

Repair as necessary.

Check for plugged, pinched, or damaged fuel tube assemblies.

Notify organizational maintenance.

Check for restricted fuel tube adapters in engine exhaust pipe.

Notify organizational maintenance.

Table 4-4. Troubleshooting-Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

2. SMOKE PRODUCED IS OF POOR QUALITY OR QUANTITY

Check for fuel running out of hull drains, or mixed with cooling air.

Repair ruptured fuel hose or loose connection. Notify organizational maintenance.

Check for plugged, pinched, or damaged fuel tube assemblies.

Notify organizational maintenance.

Check engine fuel filters.

Replace as necessary. Notify organizational maintenance.

Check for restricted fuel tube adapters in engine exhaust pipe.

Notify organizational maintenance.

3. VEHICLE SMOKES WHEN GENERATING SYSTEM IS NOT ACTIVATED

Check for voltage at solenoid valves.

If voltage is indicated, check wiring harness and bulkhead connectors for short circuit. Notify organizational maintenance.

Check solenoid valves.

Replace solenoid valves if they do not shut off fuel flow.

APPENDIX A.

REFERENCES

A-1. Publication Indexes.

The following indexes should be checked often for latest changes or revisions of references listed in this appendix and for new publications on the material covered in your manual.

DA Pam 108-1	Index of Army Motion Pictures, Film Strips, Slides and Phono-Recordings
DA Pam 310-1	Index of Administrative Publications
DA Pam 310-2	Index of Blank Forms
DA Pam 310-3	Index of Training Publications
DA Pam 310-4	Index of Technical Manuals, Technical Bulletins
DA Pam 310-6	Index of Supply Manuals
DA Pam 310-7	Index of Modification Work Orders

A-2. Publications Referenced.

The following publications are referenced within this manual or are to be used with it.

AR 385-40	Field Report of Accidents
AR 746-1	Color, Marking and Preparation of Equipment for Shipment
FM 5-20	Camouflage, Basic Principles and Field Camouflage
FM 20-22	Vehicle Recovery Operations
FM 23-65	Browning Machinegun, Caliber .50 HB, M2

FM 31-70	Basic Arctic Manual
FM 31-71	Operations in the Arctic
FM 31-72	Mountain Operations
LO 9-2350-256-12	Lubricational Order for Recovery Vehicle, Full Tracked: Medium, M88A1
TB 746-93-1	Color and Markings of Military Vehicles, Construction Equipment, and Materials Handling Equipment, Change 2
TM 9-1005-213-10	Operator's Manual for Caliber .50 Machinegun and Mount
TM 9-207	Operation and Maintenance of Ordance Materiel in Extreme Cold Weather, 0° to -65°F
TM 9-213	Painting Instructions for Field Use
TM 9-237	Operator's Manual; Welding Theory and Application
TM 9-238	Deep-Water Fording of Ordance Materiel
TM 9-2350-256-ESC	Equipment Serviceability Criteria (ESC)
TM 9-5130-338-15P	Organizational, Field and Depot Maintenance Repair Parts List for Wrench, Impact, Hydraulic (5130-00-790-2284), Change 1
TM 9-6140-200-12	Operator's and Organizational Maintenance Manual for Lead Acid Storage Batteries
TM 11-5820-401-12	Operator's and Organizational Maintenance Manual for AN/VRC-44 and AN/VRC-46 Radio Sets

TM 11-5820-498-12	Operator's and Organizational Maintenance Manual for AN/VRC-64 Radio Set
TM 11-5830-340-12	Intercommunication Set AN/VIC-1 (V)
TM 21-306	Manual for the Tracked Combat Vehicle Driver
TM 38-750	The Army Maintenance Management System (TAMMS)
TM 750-244-6	Procedures for Destruction of Tank-Automotive Equipment to Prevent Enemy Use (U.S. Tank-Automotive Command)
AR 75-1	Malfunctions Involving Ammunition and Explosives
TM 740-90-1	Administrative Storage of Equipment
TM 43-0002-31	Destruction of Chemical Weapons and Defense Equipment to Prevent Enemy Use
TM 9-1300-200	Ammunition, General
FM 5-25	Explosives and Demolitions
TM 9-1330-200 -12	Operator's and Organizational Maintenance Manual for Grenades
TM60E-3-2-3	Explosive Ordinance Disposal Procedures, Grenade, Smoke, Model L8A1

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APPENDIX B.

COMPONENT AND SUPPORT ITEMS LIST

Section I. INTRODUCTION

B-1. General.

This appendix lists components and support items and troop installed or authorized items. These items are required by the crew and operator for proper operation and maintenance of the M88A1.

B-2. Requisitioning.

You may order the items listed if required.

B-3. Explanation of Columns.

a. Illustrations (component and support items list only). This indicates the figure showing the item and its item number.

b. National Stock Number. This number is assigned to the item and is used when ordering a replacement.

c. Description. This describes the item by name, part number, manufacturer's code number, and location on the vehicle.

d. U/M (Unit of Measure) - (Troop Installed list only). The standard set by which items are issued.

e. Quantity Furnished with Equipment. Indicates how many of each item comes with or is to be supplied with the vehicle.

B-4. Abbreviations.

The following is a list of abbreviations appearing in the appendix:

acet - acetylene
ammo - ammunition
assy - assembly
dr - drive
dwg - drawing
ea - each

cal - caliber
cap - capacity
compt - compartment
ctr - center
cu ft - cubic feet
D - deep
dia - diameter
in - inch
IR - infrared
L - left
LAW - light assault weapon
lb (s) - pound (s)
lg - long
lub - lubricate
mach - machine
mag - magazine
med - medium
nom - nominal
non-adj - nonadjusting
oper - operate
opng - opening
ext - exterior
flex - flexible
ft - foot
HC - hexachlorethanezinc smoke mixture
HD - heavy duty
hdl - handle
hyd - hydraulic
pc - piece
psi - pounds per square inch
pt - point
R - right
rd - round
sa - small arm
sq - square
W - wide
wd - wide
w/- - with
w/e - with equipment
w/o - without
w/oe - without equipment
x - by (as in 2 x 4)

Section II. COMPONENTS AND SUPPORT ITEMS LIST

(1) ILLUSTRATION		(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION		(4) QTY FURN WITH EQUIP
(a) FIG. NO.	(b) ITEM NO.		PART NUMBER & FSCM	USABLE ON CODE	
			MISCELLANEOUS EQUIPMENT		
B-5	18	2530-01-004-4209	LOCK, TRACK, lockout: under drawers in front of main oddment compt., right side, 11672126 (19207)		2
B-4	1	8120-00-282-8083	CYLINDER, comp. gas, "oxygen" 250 cu. ft., 2265 psi, ICC Spec. 3AA w/valve and cap (filled): on exterior, rear of cab, on engine deck, MS39224-17 (96906)		1
B-8	62	7690-01-056-2033	DIAGRAM, strap locator: in pamphlet bag, 11672125 (19207)		1
B-4	5	6830-00-292-0137	ACETYLENE, TECHNICAL: comp. gas, 125 cu. ft. 250 psi, ICC Spec. 8 or 8AL, w/valve and cap (filled) approx. 105 in. dia. x 29 in. high: in acetylene compt., left rear cab wall, BBA106 (81348)		1
B-8	13	5130-00-790-2284	WRENCH, impact, hydraulic, 3/4" sq, dr.: in exterior compt., right side, 8395499 (19207)		1
B-8	43.1	5130-01-084-6025	SOCKET Wrench, power drive: 6pt. thin wall, 1 5/16 opng., 1 13/16 max. o. d. (use on track center guide nut), in small parts box, 1089487-1 (19207)		1
			ARMAMENT		
B-6	1	1005-00-836-7286	MOUNT, machinegun, cal. .50: on commander's cupola, 8367286 (19207)		1
			OR		
		1005-00-704-6650	Mount, machinegun, cal. .50, 7046650		
	3		DELETED		

Note: All data on pages B-4 and B-5 deleted.

Section II. COMPONENTS AND SUPPORT ITEMS LIST

(1) ILLUSTRATION		(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION PART NUMBER & FSCM USABLE ON CODE	(4) QTY FURN WITH EQUIP
(a) FIG. NO.	(b) ITEM NO.			
			MISCELLANEOUS EQUIPMENT	
B-8	12	2590-00-148-7961	CABLE KIT, Special Purpose: Adaptive in small parts box; cable under right air cleaner on floor; optional with adapter p/n 11677570 and cable p/n 11682336-1, 11682379-1 (19207)	1
			Optional	
B-8	15	5935-00-322-8959	1-ADAPTER, connector, slave cable to receptacle: in small parts box, 11677570 (19207)	
B-8	12	6150-01-022-6004	1-CABLE ASSEMBLY, POWER ELECTRICAL: 24V, 20-ft lg (slave cable): on floor under right air cleaner, 11682336-1 (19207)	
B-8	44	7240-00-222-3088	CAN, gasoline, military, 5-gallon: on interior of right and left access door, MIL-C-1283, 11677019 (19207)	2
B-8	46	7240-00-242-6153	CAN, water, military, 5-gallon: on floor, right and left side of cable chute near comdr., 11655980 (19207)	2

Section II. COMPONENTS AND SUPPORT ITEMS LIST

(1) ILLUSTRATION		(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION		(4) QTY FURN WITH EQUIP
(a) FIG. NO.	(b) ITEM NO.		PART NUMBER & FSCM	USABLE ON CODE	
			MISCELLANEOUS EQUIPMENT - Continued		
B-5	7	4010-00-473-6166	CHAIN, utility, single-leg, 5/8 x 16 ft. w/hook and end link (2): in right basket under floor, behind driver, 7077063 (19207)		2
B-8	14	5110-00-188-2524	CUTTER, bolt, rigid-HD., clipper cut 5/8" bolt and 9/16" rod cap, 36": on acetylene compartment door, GGG-C-740 (81348)		1
B-8	26	5110-00-293-1066	CUTTER, wire rope, hand oper. hammer impact, 1-1/2" cap. pedestal type: in compt., right side exterior, GGG-C-00800TYP3S1 (81348)		1
B-8	1	4930-00-288-1511	ADAPTER, grease gun coupling lubr. hyd, gun tube, flex. 12" lg. (style C fix. X): in rear oddment compt., right side, MIL-L-4387 Type iv, class I 5349744 (19207)		1
B-8	11	6545-00-922-1200	FIRST AID KIT, motor vehicle, 12 unit, size 1: in rear oddment compt., right side, 11677011 (19207)		1
B-8	48	7240-00-404-9795	FUNNEL, plastic, 1/2 gallon: in compt., right side exterior, L-F-1593 (81348)		1
B-8	17	8415-00-268-7870	GLOVES, leather, work, w/o gauntlet: in drawer, left section main oddment compt., MIL-G-2366 (81349)		4
B-8	2	4930-00-766-3545	LUBRICATING GUN, 21 oz. cap., 18,000 psi: In rear oddment compartment right side, MIL-G-3859, 10947522 (19207)		1

Section II. COMPONENTS AND SUPPORT ITEMS LIST

(1) ILLUSTRATION		(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION		(4) QTY FURN WITH EQUIP
(a) FIG. NO.	(b) ITEM NO.		PART NUMBER & FSCM	USABLE ON CODE	
			MISCELLANEOUS EQUIPMENT - Continued		
B-8	56	5120-00-188-1790	JACK, hydraulic, hand, 30 ton cap. w/oper. hdle.: 1 in tray under floor behind driver, 1 in rack under cal. .50 ammo rack, left side, MS16282-1 (96906)		2
B-8	55	5120-00-224-7330	JACK, hydraulic, hand, 12 to cap.: in rack under cal. .50 ammo rack, left side, GGG-J-63 type 1, class 2, style B, E12-9A (28047)		1
B-6	10	8415-00-266-8843	MITTENS, HEAT PROTECTIVE: asbestos, M1942, in small parts box, MIL-M-11199 (81349)		2
B-8	47	2540-00-653-7589	PAULIN, cotton duck, 12 ft, x 12 ft.: in basket on front engine deck, 6537589 (19207)		1
			SUBSTITUTE		
		8340-00-256-9122	PAULIN, cotton duck, 12 ft. x 17 ft., 24-P-41-400		
B-8	58	4020-00-231-9014	ROPE, fibrous, 100 ft., 3/4 in. diameter: on paulin on engine deck, T-R-605, Type M, class 2, T-R-605 (81348)		1
B-8	8	7240-00-177-6154	SPOUT, can, flex. nozzle. cam type: in main oddment compt., right side, 838-A-7511 (09647)		2
B-8	42	5140-00-498-8772	TOOL BOX, mech. gen. w/tote 21" L., 8-1/2" W, 7-3/8" D. (empty) (for small parts): under ammo rack, cal. .50 near left access door, CH77 (80063)		1

Section II. COMPONENTS AND SUPPORT ITEMS LIST

(1) ILLUS-TRATION		(2)	(3)	(4)
(a) FIG. NO.	(b) ITEM NO.	NATIONAL STOCK NUMBER	DESCRIPTION PART NUMBER & FSCM USABLE ON CODE	QTY FURN WITH EQUIP
			SIGHTING AND FIRE CONTROL EQUIPMENT	
B-7	2	6650-00-704-3549	PERISCOPE, M17 (T24) (driver, mechanic and rigger): at each crew position, 7043549 (19207)	7
B-7	1	1240-00-344-4647	PERISCOPE, M24 (T41) (driver's-IR): 1 in box 7972888 On cable chute near cmdr., 8293676 (19200)	1
			OR	
B-7	1	1240-01-005-6036	PERISCOPE, M24A1, 11747127 (19200)	1
			TOOLS AND EQUIPMENT, WELDING AND CUTTING	
B-4	9	5120-00-965-0603	BOX, flint tip, friction igniter w/holder, sleeve type, threaded, 5-40 NC 6-per box: in small parts box, GG-I-271, 12-010 (22527)	1
B-4	10	3439-00-270-6047	CLEANER SET, welding and cutting tips, 12-pc. in metal case: in small parts box, MIL-C-17223 (81349)	1
B-4	11		GLOVES, welders, leather gauntlet, size-large: in small parts box, KK-G-486C (81348)	1
B-4	12	4240-00-203-3804	GOGGLES, ind. welder's w/eye cups, plastic, ventilated, w/hardened glass filter lens (Type II) CO-BS shade No. 6, w/hardened glass covered lens (Type III), 50MM dia. lens, w/2-hardened spare cover lens, headband supported, over-spectacle type, w/o case: in small parts box, GGG-G-513 (81348)	1

Section II. COMPONENTS AND SUPPORT ITEMS LIST

(1) ILLUS-TRATION		(2)	(3)		(4)
(a) FIG. NO.	(b) ITEM NO.	NATIONAL STOCK NUMBER	DESCRIPTION PART NUMBER & FSCM	USABLE ON CODE	QTY FURN WITH EQUIP
			TOOLS AND EQUIPMENT, WELDING AND CUTTING - Continued		
B-4	13	4720-00-092-9266	HOSE ASSEMBLY, NON-METALLIC: gas, 'acetylene', red, w/coupling, 5/16" x 50 ft. (Type II) (Substitute hose, acet., 5/16 x 50 ft. CE No. 33-5080-050): on left side of acetylene compt., ZZ-H-461 (24161)		1
B-4	14	4720-00-293-7997	HOSE, NONMETALLIC: gas, 'oxygen', green, w/couplings, 5/16" x 50 ft (Type II), on left side of acetylene compt., ZZ-H-461 (24161)		1
B-4	8	5120-00-965-0326	IGNITERS, friction, wire frame style rd-file, single flint, hooded type: in small parts box GG-I-271 type 1, style A, G35 (93084)		1
B-4	2	3433-00-294-6743	TORCH SET, "acetylene and oxygen", med. duty, w/wrench, 5-weld and 3-cut tips: in small parts box, MIL-T-13880, Type 2 (81349)		1
B-4	3	5120-00-264-3796	WRENCH, open end, adjustable single head, str-handle, 0" to 1.322" jaw opng. cap., 12" long: in small parts box, D712 (19915)		1
B-4	7	5120-00-494-1911	WRENCH, plier, curved jaw style, w/wire cutter, 8-1/2" lg.: in small parts box, 11655775-3 (19207)		1
B-4	6	5120-00-277-4244	WRENCH, plier, vise grip - 8-1/2" lg: in spare parts box, GGG-W-00471, Type 13C		1
B-4	4	5120-00-494-1929	WRENCH, torch and regulator, "acetylene and oxygen": in small parts box, 8090028 (80382)		1

Section II. COMPONENTS AND SUPPORT ITEMS LIST

(1) ILLUS-TRATION (a) FIG. NO.	(1) ILLUS-TRATION (b) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION PART NUMBER & FSCM	(3) USABLE ON CODE	(4) QTY FURN WITH EQUIP
			TOOLS, COMMON		
B-8	30	5120-00-526-6044	BAR, pinch, 9/16" dia. stock x 11-7/8" lg.: in small parts box, 5266044 (19204)		1
B-8	28	5120-00-239-8251	PLIERS, lineman's, w/side cutter style 10, sect. A, ref, dwg. group 61 Fed C66-P-471, Type IX, Class I, style A nom. size 8": in small parts box, 1950 (72368)		1
B-8	23	5120-00-227-7338	SCREWDRIVER, flat tip, extra HD S-hdle, w/wd-inserts, 5" blade: in small parts box MS15220-5 (96906)		1
B-8	40	5120-00-264-3793	WRENCH, adjustable, auto. type, 15" lg., 0" to 3-5/8" jaw opng.: in small parts box, GGG-W-631 (81348)		1
B-8	41	5120-00-240-1414	WRENCH, open-end, adjustable Sgl-HD., 2-1/16" jaw opng. 18" lg: in small parts box, GGG-W-631 (81348)		1
B-8	29	5120-00-277-2307	WRENCH, open-end, fixed, dbl-HD 15° HD-angle, engrs 5/16" and 3/8" opngs., 3-3/4" lg.: S1012 (55719) in small parts box		1
B-8	39	5120-00-277-9076	WRENCH, spanner, adjustable hook: in small parts box, GGG-W-665 (81348)		1

Section II. COMPONENTS AND SUPPORT ITEMS LIST

(1) ILLUSTRATION		(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION		(4) QTY FURN WITH EQUIP
(a) FIG. NO.	(b) ITEM NO.		PART NUMBER & FSCM	USABLE ON CODE	
			TOOL, SPECIAL		
B-8	4	5120-01-016-2149	FIXTURE, track connecting, w/bar lever: in basket on winch mount under sub-floor, left side; bars in left basket under floor behind driver, 12252120 (19207)		2
			OR		
		5120-00-605-3926	FIXTURE, track connecting, w/bar lever 8741739 (19200)		
B-8	10.1	5120-00-340-2013	ADAPTER, FIXTURE TRACK: socket wrench 3/4" sq.-drive to attach impact wrench to track fixture: in small parts box, 8708133 (19207)		2
B-8	9	5120-01-052-5642	PULLER AND PUMP END CONNECTOR, TRACK: (link pin): under drawers in front oddment compartment, right side, GGG-W-631 (81348)		1
B-8	5	5120-00-277-6470	WRENCH, ADJUSTABLE: 2 15/16 in. to 4 3/4 in. jaw opening: on cal. .50 ammo. rack near left acess door, GGG-W-631, Type I, Class 2, (81348)		1

Section II. COMPONENTS AND SUPPORT ITEMS LIST

(1) ILLUSTRATION		(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION		(4) QTY FURN WITH EQUIP
(a) FIG. NO.	(b) ITEM NO.		PART NUMBER & FSCM	USABLE ON CODE	
			TOOLS, PIONEER		
B-8	20	5110-00-293-2336	AXE, SINGLE BIT: 4 lbs, in pioneer rack on ext, right side, GGG-A-926, 6150925 (19207)		1
B-5	20	5120-00-224-1390	CROWBAR: pinch point, 5′ long 1-1/4″ wide, on top of engine deck cover, GGG-B-101 (81348)		2
B-8	18	5120-00-288-6574	HANDLE, MATTOCK: 36″ long, (grade AA) in pioneer rack on ext right side, NN-H-0093, B Grade (81348)		1
B-8	19	5120-00-243-2395	MATTOCK: pick, w/o handle, (Type II, class F), in pioneer rack on ext right side, GGG-H-406, 1950 (72368)		1
B-8	16	5120-00-293-3336	SHOVEL, HAND: general purpose, D-handled size 2, round point in pioneer rack on ext right side, MS17088-1 (96906)		1
B-5	21	5120-00-900-6097	HAMMER, HAND: blacksmith, dble-face, 10 lbs, (Type X, Class I) above pioneer rack on ext right side, GGG-H-0086 (80244)		1

Section II. COMPONENTS AND SUPPORT ITEMS LIST

(1) ILLUSTRATION		(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION		(4) QTY FURN WITH EQUIP
(a) FIG. NO.	(b) ITEM NO.		PART NUMBER & FSCM	USABLE ON CODE	
			MISCELLANEOUS EQUIPMENT		
B-8	3	4930-00-204-2550	ADAPTER, GREASE GUN: thin stem gun, lubr, sleeve type, stowed on lubr gun in rear oddment compt, right side, MIL-L-4387, Type IV, Class 2, 5349744 (19207)		1
B-5	4	3940-00-105-9933	BLOCK, TACKLE: snatch, wire rope, 10-ton, above fender, left, 11631726 (19207)		1
B-5	3	3940-00-792-9881	BLOCK, TACKLE: snatch, wire rope, 25-ton, above spade, left front, 8379923 (19207)		1
B-5	2	3940-00-792-9882	BLOCK, TACKLE: snatch, wire rope, 90-ton, above spade, engine deck, 8379922 (19207)		2
B-5	5	4010-00-449-6573	CHAIN ASSEMBLY: single leg, utility, 3/4" x 12 ft, in exterior compt, left side, 8744250 (19207)		2
B-8	53	4210-00-683-8815	EXTINGUISHER, FIRE: portable, 5-lb. CO_2, in brackets in cab interior, 7359703 (19207)		2
			OR		
		4210-00-270-4512	EXTINGUISHER, FIRE: portable, 5-lb. CO_2, in brackets in cab interior, 7714780 (19207)		2

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Section II. COMPONENTS AND SUPPORT ITEMS LIST

(1) ILLUSTRATION (a) FIG. NO.	(1) ILLUSTRATION (b) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION PART NUMBER & FSCM USABLE ON CODE	(4) QTY FURN WITH EQUIP
			MISCELLANEOUS EQUIPMENT - Continued	
B-8	54	9905-00-534-8376	WARNING DEVICE KIT: reflector type 2/flags, in main oddment, right side, 8744251 (19207) Composed of: 1 - CARRIER (Brkt) 2 - FLAG, red, 12" x 12" 2 - FLAGSTAFF, folding type 3 - REFLECTOR, red	1
			OR	
		9905-00-148-9546	HIGHWAY, FLARE KIT WARNING DEVICE SET: portable, triangular-shaped, with open center, 3 devices per set, in container RR-W-1817 (81348)	1
B-8	7	4720-00-792-9884	HOSE ASSEMBLY: impact wrench, 3/8" x 25 ft long, in compt, right side exterior, 10867295 (19207)	2
B-8	6	5130-00-792-9883	HOSE ASSEMBLY: impact wrench 1/2" x 25 ft long, in compt, right side exterior, 10867293 (19207)	2

Section II. COMPONENTS AND SUPPORT ITEMS LIST

(1) ILLUS-TRATION (a) FIG. NO.	(b) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION PART NUMBER & FSCM USABLE ON CODE	(4) QTY FURN WITH EQUIP
			MISCELLANEOUS EQUIPMENT - Continued	
B-8	51	6230-00-498-9408	LANTERN, ELECTRIC: portable, 6 volt, w/o battery, in main oddment compt, right side, A5330039, MIL-L-18838 (81349)	1
B-8	34	6230-00-086-4293	LIGHT, EXTENSION: inspection, 25 ft. lg. w/single contact plug and socket, in small parts box, C6209297 (19204)	1
B-8	52	6220-00-796-2657	LIGHT, FLASHER: portable, in case on rear of Comdr. Set, 8387795 (19207)	1
B-8	45	2590-00-861-9982	NOZZLE ASSEMBLY, FUEL: in compt, right side exterior, 10884808 (19207)	1
B-8	32	5340-00-682-1505	PADLOCK SET: 1-3/4" w/clevis includes (5) locks and (7) keys, keyed alike, 1 cable, 1 cab side door, 1 right and 1 left stowage compt, door, 1 APU access door, MIL-P-17802, MS21313-52 (96906)	1
B-8	50		DELETED	
B-8	49	4710-00-792-9886	TUBE ASSEMBLY, METAL: filler, nozzle, 34" long, in ext, compt, right side, 10867298	1
B-8	59	5120-00-293-0110	VISE, BENCH AND PIPE: 5" jaw and 6" opng, on engine deck, left side, GGG-V-410, 7974484 (19207)	1
B-8	64	4730-00-277-5609	BUSHING: reducer, 3/4" pipe for external thread and 1/2 pipe for internal thread, AN912-7	2
B-8	65	4730-00-194-0219	BUSHING: reducer, 3/4" pipe for external thread and 3/8 pipe for internal thread, AN912-8	2
B-8	66	4730-00-905-2692	COUPLING, PIPE: 3/4" NPT MS39233-5, in small parts box	1

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Section II. COMPONENTS AND SUPPORT ITEMS LIST

(1) ILLUSTRATION		(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION		(4) QTY FURN WITH EQUIP
(a) FIG. NO.	(b) ITEM NO.		PART NUMBER & FSCM	USABLE ON CODE	
			EQUIPMENT, TOWING		
B-5	6	2540-00-378-2012	TOW BAR, MOTOR VEHICLE: tow, HD, 8-1/2 ft lg, above tow pintle - rear of vehicle 8383803 (19207), complete with standard clevis, 8724449, and standard pins, 10929861 (19207) and lock pin 5213744 (19207)		1
B-5	1	4010-01-041-9752	WIRE ROPE ASSEMBLY: tow, steel, 1-1/8" dia. 15 ft lg, 1 above left fender, 1 above right fender, 7360553-1 (19207)		2
B-5	19	4010-00-133-6517	CHAIN ASSEMBLY, DOUBLE LEG: Lifting, HD 7/8", draped around tow pintle, 10929894 (19207)		1
B-5	8	2540-00-589-6391	CLEVIS, TOW BAR, HD: in right basket under floor, behind driver, 8383805 (19207)		4
		2540-00-863-3153	CLEVIS ASSEMBLY: tow bar (med. duty), in ext compt, left side, 10894255 (19207)		2
B-5	14	2540-00-706-8219	HOOK, TOW CABLE: in ext compt, left side 7068219 (19207)		4
B-5	15	5315-00-706-9195	PIN, GROOVED, HEADED: tow cable hook (used with hook 7068219), in ext compt, left side, 7069195 (19207)		4
B-5	9	5315-00-200-8376	PIN, GROOVED, HEADED: clevis, tow bar (used with clevis 8383805), attached to clevis 8383805 in right basket under floor, behind driver, 8383813 (19207)		4
B-5	10	5315-00-708-7811	PIN, LOCK: clevis, tow bar (used with pin 8383813 and clevis 8383805), attached to pin 8383813 and clevis 8383805, in right basket under floor, behind operator 708711 (19207)		4

Section II. COMPONENTS AND SUPPORT ITEMS LIST

(1) ILLUSTRATION		(2)	(3)	(4)
(a) FIG. NO.	(b) ITEM NO.	NATIONAL STOCK NUMBER	DESCRIPTION PART NUMBER & FSCM USABLE ON CODE	QTY FURN WITH EQUIP
			EQUIPMENT, TOWING - Continued	
B-4	15	4820-00-281-8190	VALVE, REGULATING, FLOW: pressure, comp gas, "acetylene", w/coupling, adapter and outlet, Type V, in oddment compt, MIL-R-13877, R2047 (86346)	1
B-4	16	4820-00-641-3519	VALVE, REGULATING, FLOW: pressure, fluid pressure "oxygen" w/coupling, adapter and outlet Type VI (Linde Purox R-201 or equal), in oddment compt, above acetylene compt, MIL-R-13877 (81349)	1
B-5	13	2540-00-318-0326	SHACKLE ASSEMBLY: anchor, 7/8" dia. with pin 7357982, in right basket under floor, behind driver, 7357967 (19207)	6
B-5	17	4030-00-171-4521	SHACKLE: 7/16" dia. w/pin 7357978: in small parts box, 7357963 (19207)	4
B-5	12	4030-00-542-3125	SHACKLE: 1-1/4" dia. with pin 7357986, (for "V" type utility chain), in ext compt, left side, CAU45-2641-2 (81361)	2
B-5	11	4030-00-675-9029	SHACKLE: 1-3/4" dia. w/pin 7357988, in right basket under floor, behind driver, 7357973 (19207)	2
			SPARE PART, TOWING	
B-5	6	2540-00-378-2012	TOW BAR, MOTOR VEHICLE: tow "V", HD 8-1/2 ft lg, above left rear fender, 8383802 (19207), complete with standard clevis, 8724449, and standard pin, 10929861 (19207) and lock pin 5213744 (19207)	1

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Section II. COMPONENTS AND SUPPORT ITEMS LIST

(1) ILLUS-TRATION		(2)	(3)	(4)
(a) FIG. NO.	(b) ITEM NO.	NATIONAL STOCK NUMBER	DESCRIPTION PART NUMBER & FSCM USABLE ON CODE	QTY FURN WITH EQUIP
			SPARE PART, TOWING - Continued	
B-8	35	4010-00-291-7979	CHAIN ASSEMBLY, SINGLE LEG: (for shackle 7357963), in small parts box 7357978 (19207)	2
B-8	37	5315-00-708-7811	PIN, LOCKING: extra HD used w/pin 8383813 and clevis 8383805 in small parts box, 7087811 (19207)	8
B-8 B-5	36 16	5315-00-350-4326	PIN, LOCKING: attaching, for heavy-duty tow bar, in small parts box, 5213744 (19207)	16
			TOOLS, COMMON	
B-8	43	2540-00-670-2459	BAG, PAMPHLET: on front side of oddment compt, right side, 7961712 (19207)	1
B-8	60	7510-00-738-6164	BINDER, LOOSE-LEAF: (for manuals) in pamphlet bag 7961712 (19207)	1
B-8	61		DELETED	
B-8	63A		DELETED	
B-8	57A		FORM, component register: in binder, equip. log book, DA Form 2408-10	1
B-8	57B		FORM, equip. control record: in binder, equip. log book, DA Form 2408-9	1
B-8	57C		FORM, log book index: in binder, equip. log book, DA Form 2408	1
B-8	57D		FORM, modification record: in binder, equip. log book, DA Form 2408-5	1

Section II. COMPONENTS AND SUPPORT ITEMS LIST

(1) ILLUSTRATION (a) FIG. NO.	(1) ILLUSTRATION (b) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION PART NUMBER & FSCM USABLE ON CODE	(4) QTY FURN WITH EQUIP
			TOOLS, COMMON - Continued	
B-8	21	5120-00-935-4641	KEY, socket head screw, hex, drive, L-type handle, 20 keys w/case: in rear oddment compt, right side, GGG-K-275, type I, class I (55719)	1
			Composed of:	
			1 - CONTAINER, wrench, socket head screw (bag, wrap, roll or case), GGG-W-652 (81348)	
		5120-00-555-2639	1 - KEY, socket head screw, 0.028 hex, GGG-K-275 (81348)	
		5120-00-198-5400	1 - KEY, socket head screw, 0.035 hex, GGG-K-00275 (81348)	
		5120-00-198-5401	1 - KEY, socket head screw, 0.050 hex, GGG-K-00275 (81348)	
		5120-00-198-5398	1 - KEY, socket head screw, 1/16" hex, GGG-K-00275 (81348)	
		5120-00-224-2504	1 - KEY, socket head screw, hex, 5/64", 1-31/32" long, 41-W-2446 (80244)	
		5120-00-242-7410	1 - KEY, socket head screw, hex, 3/32", 2-3/32" long, 41-W-2449-2 (10001)	
		5120-00-889-2162	1 - KEY, socket head screw, 7/64" hex, GGG-K-00275 (81348)	
		5120-00-240-5292	1 - KEY, socket head screw, hex 1/8", GGG-K-00275 (81348)	
		5120-00-889-2163	1 - KEY, socket head screw, 9/64" hex, GGG-K-00275 (81348)	

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Section II. COMPONENTS AND SUPPORT ITEMS LIST

(1) ILLUSTRATION		(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION		(4) QTY FURN WITH EQUIP
(a) FIG. NO.	(b) ITEM NO.		PART NUMBER & FSCM	USABLE ON CODE	
			TOOLS, COMMON - Continued		
		5120-00-198-5392	1 - KEY, socket head screw, hex, 5/32", GGG-K-00275, (81348)		
		5120-00-240-5300	1 - KEY, socket head screw, hex, 3/16", GGG-K-00275 (81348)		
		5120-00-242-7411	1 - KEY, socket head screw, hex, 7/32", 3-7/32" long, 41-W-2453 (95683)		
		5120-00-224-4659	1 - KEY, socket head screw, hex, 1/4", 3-11/32" long, GGG-K-00275 (81348)		
		5120-00-240-5274	1 - KEY, socket head screw, hex, 5/16", 3-27/32" long, GGG-K-00275 (81348)		
		5120-00-198-5390	1 - KEY, socket head screw, (set) hex, 3/8", 4-1/4" long, GGG-K-00275 (81348)		
		5120-00-240-5277	1 - KEY, socket head screw, 7/16" hex, GGG-K-00275 (81348)		
		5120-00-198-5391	1 - KEY, socket head screw, hex, 1/2", 5-11/32" long, GGG-K-00275 (81348)		
		5120-00-240-5268	1 - KEY, socket head screw, hex, 9/16", 5-27/32" long, GGG-K-00275 (81348)		
		5120-00-224-2510	1 - KEY, socket head screw, hex 5/8", 6-1/4" long, GGG-K-00275 (81348)		
		5120-00-222-1489	1 - KEY, socket head screw, 3/4" hex, GGG-K-00275 (81348)		
B-8	63B		MANUAL, technical (operator's): in pamphlet bag, TM 9-2350-256-10		1

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Section II. COMPONENTS AND SUPPORT ITEMS LIST

(1) ILLUSTRATION (a) FIG. NO.	(1) ILLUSTRATION (b) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION PART NUMBER & FSCM USABLE ON CODE	(4) QTY FURN WITH EQUIP
			TOOLS, COMMON - Continued	
B-8	63C		MANUAL, technical (wrench, impact, hydraulic): in pamphlet bag, TM 9-5130-338-15P	1
B-8	63D		ORDER, lubrication: in pamphlet bag, LO 9-2350-256-12	1
B-8	10	5130-00-964-9113	SOCKET, socket wrench, power drive 6-pt thin wall, 1-1/4" opng (used on track-center guide nut): in small parts box, 10894847 (19207)	1
B-8	38	5120-00-293-0245	WRENCH, spanner, non-adj face, 2-1/4" ctr to ctr of pins, 1/4" in dia. 6-7/8" long: in small parts box, 325291 (36659)	1
B-8	27	5130-00-357-5135	WRENCH SET, socket, 3/4" sq dr 6-pt, HD industrial type, w/case w/extension bars, 9/16" to 1-1/2" opng, 18 pcs: in main oddment compt, right side, 40-W-7036-425 (80244)	1
			Composed of:	
		5130-00-449-6656	1 - EXTENSION, socket wrench, HD, 3/4" sq drv 7" long, MS16577-7 (96906)	
		5130-00-449-6657	1 - EXTENSION, socket wrench HD, 3/4" sq dr 13" long, MS16577-8 (96906)	
		5120-00-199-7768	1 - SOCKET, SOCKET WRENCH: set metal hinged cover, OD finish (empty): in oddment tray, GGG-W-461, 5558 (47805)	

Section II. COMPONENTS AND SUPPORT ITEMS LIST

(1) ILLUSTRATION (a) FIG. NO.	(1) ILLUSTRATION (b) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION PART NUMBER & FSCM USABLE ON CODE	(4) QTY FURN WITH EQUIP
			TOOLS, COMMON - Continued	
		5130-00-227-6698	1 - SOCKET, socket wrench, 3/4" sq dr 6-pt HD, 9/16" opng, C67445 (11976)	
		5130-00-227-6699	1 - SOCKET, wrench attaching, 3/4" sq dr 6-pt HD, 5/8" opng, AS618 (65814)	
		5130-00-227-6700	1 - SOCKET, socket wrench, 3/4" sq dr 6-pt HD, 11/16" opng, C62247 (11976)	
		5130-00-227-6701	1 - SOCKET, socket wrench, 3/4" sq dr 6-pt HD, 3/4" opng, MS16581-37 (96906)	
		5130-00-227-6676	1 - SOCKET, socket wrench, 3/4" sq dr 6-pt HD, 13/16" opng, C67448 (11976)	
		5130-00-227-6677	1 - SOCKET, socket wrench, 3/4" sq dr 6-pt HD, 7/8" opng, MS16581-39 (96906)	
		5130-00-293-1411	1 - SOCKET, socket wrench, 3/4", sq dr 6-pt HD, 15/16" opng, C67449 (11976)	
		5130-00-227-6679	1 - SOCKET, socket wrench, 3/4", sq dr 6-pt HD, 1" opng, C67450 (11976)	
		5130-00-293-1412	1 - SOCKET, socket wrench, 3/4", sq dr 6-pt HD, 1-1/16" opng, MS16581-42 (96906)	

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Section II. COMPONENTS AND SUPPORT ITEMS LIST

(1) ILLUS-TRATION		(2)	(3)	(4)
(a) FIG. NO.	(b) ITEM NO.	NATIONAL STOCK NUMBER	DESCRIPTION PART NUMBER & FSCM USABLE ON CODE	QTY FURN WITH EQUIP
			TOOLS, COMMON - Continued	
		5130-00-227-6681	1 - SOCKET, socket wrench, 3/4" sq dr 6-pt HD, 1-1/8" opng, C67452 (11976)	
		5130-00-227-6683	1 - SOCKET, socket wrench, 3/4" sq dr 6-pt HD, 1-1/4" opng, C67453 (11976)	
		5130-00-227-6684	1 - SOCKET, socket wrench, 3/4" sq dr 6-pt HD, 1-5/16" opng, C67454 (11976)	
		5130-00-227-6686	1 - SOCKET,socket wrench, 3/4" sq dr 6-pt HD, 1-7/16" opng, C67457 (11976)	
		5130-00-236-3979	1 - SOCKET, socket wrench, 3/4" sq dr 6-pt HD, 1-1/2" opng, C67961 (11976)	
B-8	33	5120-00-204-1999	SOCKET WRENCH ATTACHING: socket 3/4" sq dr 12-pt w/case, 7/8" - 2" opening: in main oddment compt, right side, GGG-W-641, AS618 (65814)	1
			Composed of:	
		5120-00-181-6816	1 - SOCKET, wrench, 3/4" sq dr 12-pt, 7/8" opng, 5528 (47805)	
		5120-00-181-6813	1 - SOCKET, wrench, 3/4" sq dr 12-pt, 15/16" opng, 5530 (47805)	
		5120-00-237-0989	1 - SOCKET, wrench, 3/4" sq dr 12-pt, 1" opng, AS618 (65814)	
		5120-00-189-7928	1 - SOCKET, wrench, 3/4" sq dr 12-pt, 1-1/16" opng	

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Section II. COMPONENTS AND SUPPORT ITEMS LIST

(1) ILLUSTRATION		(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION		(4) QTY FURN WITH EQUIP
(a) FIG. NO.	(b) ITEM NO.		PART NUMBER & FSCM	USABLE ON CODE	
			TOOLS COMMON - Continued		
		5120-00-239-0021	1 - SOCKET, wrench, 3/4" sq. dr. 12 pt., 1-1/8" opng.		
		5120-00-235-5871	1 - SOCKET, wrench, 3/4" sq. dr. 12 pt., 1-1/4" opng.		
		5120-00-232-5681	1 - SOCKET, wrench, 3/4" sq. dr. 12 pt., 1-5/16" opng.		
		5120-00-189-7931	1 - SOCKET, wrench, 3/4" sq. dr. 12 pt., 1-7/16" opng. 5546 (47805)		
		5120-00-293-0094	1 - SOCKET, wrench, 3/4" sq. dr. 12 pt., 1-1/2" opng.		
		5120-00-189-7910	1 - SOCKET, wrench, 3/4" sq. dr. 12 pt., 1-9/16" opng. LDA502 (55719)		
		5120-00-199-7765	1 - SOCKET, wrench, 3/4" sq. dr. 12 pt., 1-5/8" opng. 5552 (47805)		
		5120-00-199-7768	1 - SOCKET, wrench, 3/4" sq. dr. 12 pt., 1-13/16" opng. 5558 (47805)		
		5120-00-199-7769	1 - SOCKET, wrench, 3/4" sq. dr. 12 pt., 1-7/8" opng. 5560 (47805)		
		5120-00-199-7770	1 - SOCKET, wrench, 3/4" sq. dr. 12 pt., 2" opng. 5564 (47805)		
		5120-00-273-9208	1 - EXTENSION, socket wrench, 3/4" sq. dr. 2-1/2" - 4" long, GGG-W-641 (81348)		
		5120-00-243-7328	1 - EXTENSION, socket wrench, 3/4" sq. dr. 7-1/2" - 8-1/2" long		
		5120-00-227-8079	1 - EXTENSION, socket wrench, 3/4" sq. dr. 15" - 17" long		

Section II. COMPONENTS AND SUPPORT ITEMS LIST

(1) ILLUSTRATION		(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION		(4) QTY FURN WITH EQUIP
(a) FIG. NO.	(b) ITEM NO.		PART NUMBER & FSCM	USABLE ON CODE	
			TOOLS, COMMON - Continued		
B-8	25	5120-00-249-1076	1 - HANDLE, socket wrench, ratchet type, 3/4" sq dr 18" long		
B-8	22	5120-00-709-4072	1 - HANDLE, socket wrench, T-bar, 3/4" sq dr 17" - 20" long		
B-8	24	5120-00-221-7959	1 - HANDLE, socket wrench, hinged, 3/4" sq dr 17-3/4" long		
B-8	31	5120-00-243-1687	1 - UNIVERSAL joint, socket 3/4" sq dr		

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Section III. ITEMS TROOP INSTALLED OR AUTHORIZED LIST

(1) NATIONAL STOCK NUMBER	(2) DESCRIPTION PART NUMBER & FSCM USABLE ON CODE	(3) U/M	(4) QTY AUTH
	AMMUNITION		
	CARTRIDGE, 5.56MM (For 2 rifles, 5.56MM M16/M16A1 OR Cartridge, 7.62MM (for M14's)): in 0.50 cal ammo box, M2A1, in 0.50 cal ammo rack, upper left section	EA	300
	CARTRIDGE, cal 0.45 (in 12-30 rd mg) (for 2 machinegun, cal 0.45 (M3A1)): in 2 ammo cases 7052438 in oddment tray, right of mechanic	EA	360
	CARTRIDGE, cal 0.50, linked (for machinegun, cal 0.50, M2): 1 box on machinegun, cal 0.50, 14 boxes in rack, left cab wall	EA	1500
	GRENADE, hand: in 2 boxes 7388581 subfloor, left rear of mechanic	EA	8
	LAW, (launcher and ammo): 8 in box on right cab wall, 2 in bracket above left ammo rack	EA	10
	POT, smoke, HC:	EA	12
	SIGNAL, ground flare: in box on oddment tray, left of driver	EA	12
	ARMAMENT		
8465-00-705-2438	CASE, ammo, canvas, carrying: in oddment tray, right of mechanic, 7052438 (19207) (12, figure B-6)	EA	2
1005-00-726-5636	MACHINE GUN, cal 0.50, M2 flex W/OE, 7265636 (19204): in mount on comdr. cupola	EA	1
	OR		
1005-00-322-9715	MACHINE GUN, cal 0.50, M2 flex W/E, 7265636 (19204)		

Section III. ITEMS TROOP INSTALLED OR AUTHORIZED LIST

(1) NATIONAL STOCK NUMBER	(2) DESCRIPTION PART NUMBER & FSCM USABLE ON CODE	(3) U/M	(4) QTY AUTH
	ARMAMENT - Continued		
	RIFLE, U.S., 5.56MM, M16/M16A1: 1 on right cab wall above access door; 1 on right side of winch cable shield	EA	2
	OR		
1005-00-589-1271	RIFLE, U.S., 7.62MM, M14 (alternate), 7267000		
1005-00-672-1771	SUBMACHINEGUN, cal 0.45, M3A1 W/E: 1 on left cab wall above access door; 1 on left side of winch cable shield, 6721771	EA	2
	MISCELLANEOUS		
6135-00-120-1020	BATTERY, dry, 1.5-volt, Type BA-2030/U: in flashlights, 503200	EA	8
6135-00-050-3280	BATTERY, dry, 6-volt, Type BA-200/U: 1 in portable lantern, 2 in flasher light, 050-3280	EA	3
	BOX, ammo, cal 0.50, M2A1: in upper left section of 0.50 cal ammo rack near left access door, 7553296	EA	1
8465-00-191-0366	CANTEEN, water, alum, w/o cup and cover: in cover, canteen at crew positions, 74-C-80	EA	4
	CARRIER, sleeping bag (strap): on case, sleeping bag, 2-2-201	EA	4
8465-00-237-8719	CASE, sleeping bag, waterproof: 2 on oddment tray, right of mechanic; 2 on oddment tray, left of mechanic or field pack M1945	EA	4
8465-00-379-2602	COVER, canteen dismounted M1910: on canteen, water, 74-C-300	EA	4

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Section III. ITEMS TROOP INSTALLED OR AUTHORIZED LIST

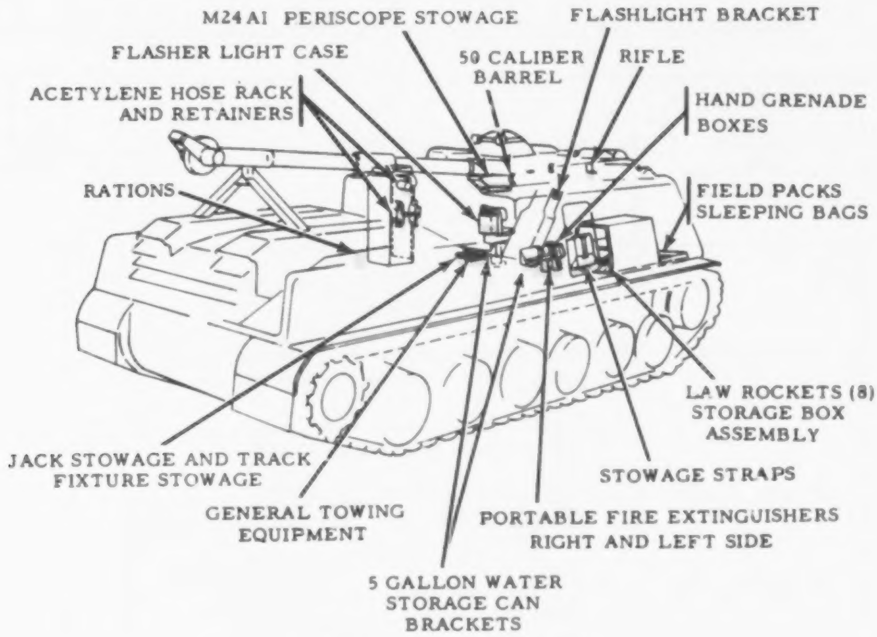
(1) NATIONAL STOCK NUMBER	(2) DESCRIPTION PART NUMBER & FSCM USABLE ON CODE	(3) U/M	(4) QTY AUTH
	MISCELLANEOUS - Continued		
6650-00-670-2518	BINOCULAR, 1717A1 W/E: in bracket on cab ceiling, front of commander. Composed of: 1- BINOCULAR, M17A1 P/N 7597723 1- CASE, carrying, M63A1 P/N 7694281 A6702518 (19207)		
8465-00-242-7843	CUP, canteen w/folding handle: on canteen, water, 74-C-317-25	EA	4
8465-00-J-100007	FIELD PACK, combat M1956: 2 on oddment tray, right of mechanic; 2 on oddment tray, left of driver	EA	4
	Optional		
8465-00-266-9918	FIELD PACK, cargo, M1945, 74-P-12-252		
	Optional		
8465-00-266-9918	FIELD PACK, combat, M1945, 74-P-12-287		
6230-00-264-8261	FLASHLIGHT, elect. hand, 2 cell w/lamp, w/o batteries: at each crew position, SC-D-21772	EA	4
8345-00-174-6865	PANEL MARKER, aerial liaison, red on side, yellow other side, 6 ft. long x 2 ft. wide w/o case: in main oddment compt., right side, MIL-P-40061, AMEN (81349)	EA	2
	RATION, individual, combat (3-day supply for 4 men): on floor under left air cleaner	EA	12

Section III. ITEMS TROOP INSTALLED OR AUTHORIZED LIST

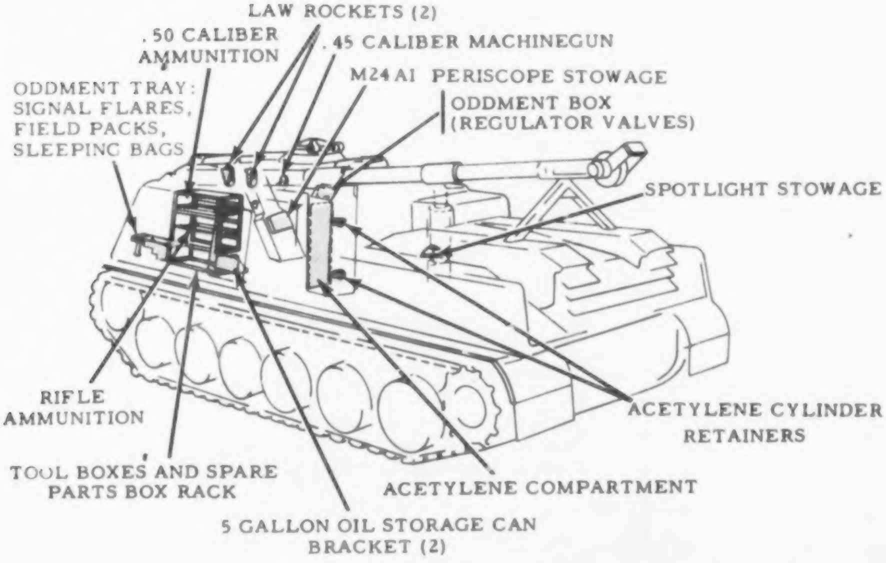
(1) NATIONAL STOCK NUMBER	(2) DESCRIPTION PART NUMBER & FSCM USABLE ON CODE	(3) U/M	(4) QTY AUTH
	RADIO SETS AND COMMUNICATIONS		
	INTERCOMMUNICATION SET, AN/VIC-1(V): 1 monitor at each crew position	EA	1
	RADIO SET, AN/VRC-44, AN/VRC-46 or AN/VRC-64 with suppressor MX-7778A and TSEC/KY-38 equipment on top of oddment compt., right side	EA	1
	MANUAL, technical (AN/VRC-44 and AN/VRC-46): in pamphlet bag, TM 11-5820-401-12	EA	1
	MANUAL, technical (AN/VRC-64): in pamphlet bag, TM 11-5820-498-12	EA	1
	MANUAL, technical (AN/VIC-1(V)): in pamphlet bag TM 11-5830-340-12	EA	1
	SPARE PARTS, VEHICULAR		
2530-00-692-9316	SHOE, track, rubber, T107: 3 above fender, right side; 3 above fender, left side, 8705914	EA	6
	Composed of:		
5306-00-706-9543	6- BOLT (used w/ctr. guide cap 8705894): in forward basket under floor- behind driver, 7069543		
5306-00-695-6188	12- BOLT, track shoe end conn. wedge: in forward basket under floor- behind driver, 8382360		
2530-00-692-9314	6- CAP, track shoe ctr. guide: in forward basket under floor- behind driver, 8705894		
2530-00-692-9317	12-CONNECTOR, track, shoe end: in forward basket under floor- behind driver, 8705919		

Section III. ITEMS TROOP INSTALLED OR AUTHORIZED LIST

(1) NATIONAL STOCK NUMBER	(2) DESCRIPTION PART NUMBER & FSCM USABLE ON CODE	(3) U/M	(4) QTY AUTH
	SPARE PARTS, VEHICULAR - Continued		
2530-00-692-9315	6 - GUIDE, track shoe center: in forward basket under floor - behind driver, 8705897		
	6 - LINK, track: 3 - above fender, right side, 3 - above fender left side 8705899		
5310-01-006-2085	6 - NUT (used w/ctr. guide cap 8705894): in forward basket under floor - behind driver, MS 51943-18		
2530-00-039-9153	12 - WEDGE, track shoe: in forward basket under floor - behind driver, 8382359		
	SPARE PARTS FOR VEHICLES SUPPORTED		
	SPROCKET, drive: right and left side - ext.	EA	2
	WHEEL, road, disc: right and left side - ext.	EA	2
	WHEEL, track support: right and left side - ext.	EA	2
	TOOLS COMMON		
5180-00-177-7033	TOOL KIT, general mech.'s w/box 21" lg., 8-1/2" wide, 7-3/8" deep, box Spec. MIL-B-3981, Type II, Class B: in rack under .50 cal. ammo rack left side, 41-T-3534-30	EA	2


M24A1 PERISCOPE STOWAGE
FLASHLIGHT BRACKET
FLASHER LIGHT CASE
50 CALIBER BARREL
RIFLE
ACETYLENE HOSE RACK AND RETAINERS
HAND GRENADE BOXES
RATIONS
FIELD PACKS SLEEPING BAGS
LAW ROCKETS (8) STORAGE BOX ASSEMBLY
JACK STOWAGE AND TRACK FIXTURE STOWAGE
STOWAGE STRAPS
GENERAL TOWING EQUIPMENT
PORTABLE FIRE EXTINGUISHERS RIGHT AND LEFT SIDE
5 GALLON WATER STORAGE CAN BRACKETS

RIGHT REAR VIEW


LAW ROCKETS (2)
.50 CALIBER AMMUNITION
.45 CALIBER MACHINEGUN
M24A1 PERISCOPE STOWAGE
ODDMENT TRAY: SIGNAL FLARES, FIELD PACKS, SLEEPING BAGS
ODDMENT BOX (REGULATOR VALVES)
SPOTLIGHT STOWAGE
RIFLE AMMUNITION
ACETYLENE CYLINDER RETAINERS
TOOL BOXES AND SPARE PARTS BOX RACK
ACETYLENE COMPARTMENT
5 GALLON OIL STORAGE CAN BRACKET (2)

LEFT REAR VIEW

TA125583

Figure B-1. Inside stowage items.

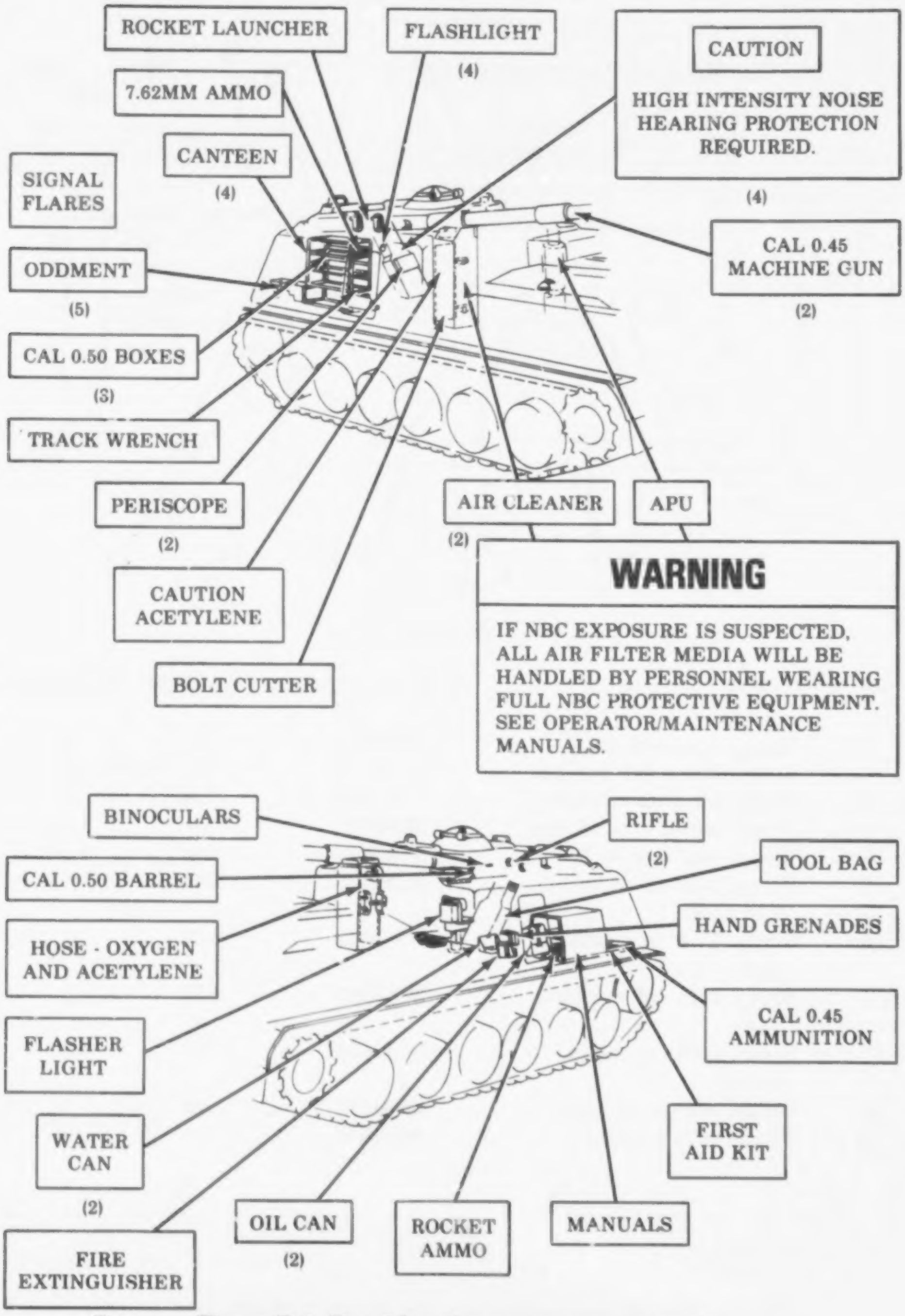
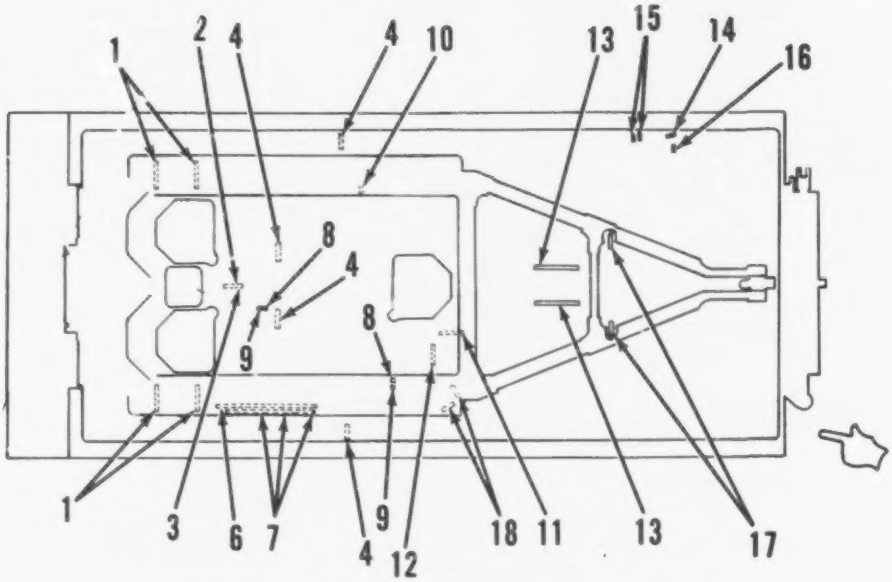

ROCKET LAUNCHER
FLASHLIGHT
(4)
CAUTION
HIGH INTENSITY NOISE HEARING PROTECTION REQUIRED.
(4)
7.62MM AMMO
CANTEEN
(4)
SIGNAL FLARES
ODDMENT
(5)
CAL 0.45 MACHINE GUN
(2)
CAL 0.50 BOXES
(3)
TRACK WRENCH
PERISCOPE
(2)
AIR CLEANER
(2)
APU
CAUTION ACETYLENE
BOLT CUTTER
WARNING
IF NBC EXPOSURE IS SUSPECTED, ALL AIR FILTER MEDIA WILL BE HANDLED BY PERSONNEL WEARING FULL NBC PROTECTIVE EQUIPMENT. SEE OPERATOR/MAINTENANCE MANUALS.
BINOCULARS
RIFLE
(2)
CAL 0.50 BARREL
TOOL BAG
HOSE - OXYGEN AND ACETYLENE
HAND GRENADES
FLASHER LIGHT
CAL 0.45 AMMUNITION
FIRST AID KIT
WATER CAN
(2)
OIL CAN
(2)
ROCKET AMMO
MANUALS
FIRE EXTINGUISHER
(2)

Figure B-2. Decal location - crew compartment.

TA171602



INTERIOR

NO.	TITLE	STRAP ASSY	LENGTH	WIDTH
1	Strap, oddment tray	8690495	120	1
2	Strap, binocular bracket	7326942	14	1
3	Strap, binocular bracket	7326943	10.62	1
4	Strap, water and oil can	8690527	54	1.50
6	Strap, tool box rack	8690536	88	1.50
7	Strap, 0.50 cal ammunition rack	8690486	80	1
8	Strap, 0.45 cal machine gun	8684028	3.25	1
9	Strap, 0.45 cal machine gun	8684030	9.25	1
10	Strap, 0.50 cal spare barrel	8690462	12	1
11	Strap, acetylene hose	8690470	28	1
12	Strap, ration boxes	8690479	54	1

Figure B-3. Stowage strap location diagram (Sheet 1 of 2).

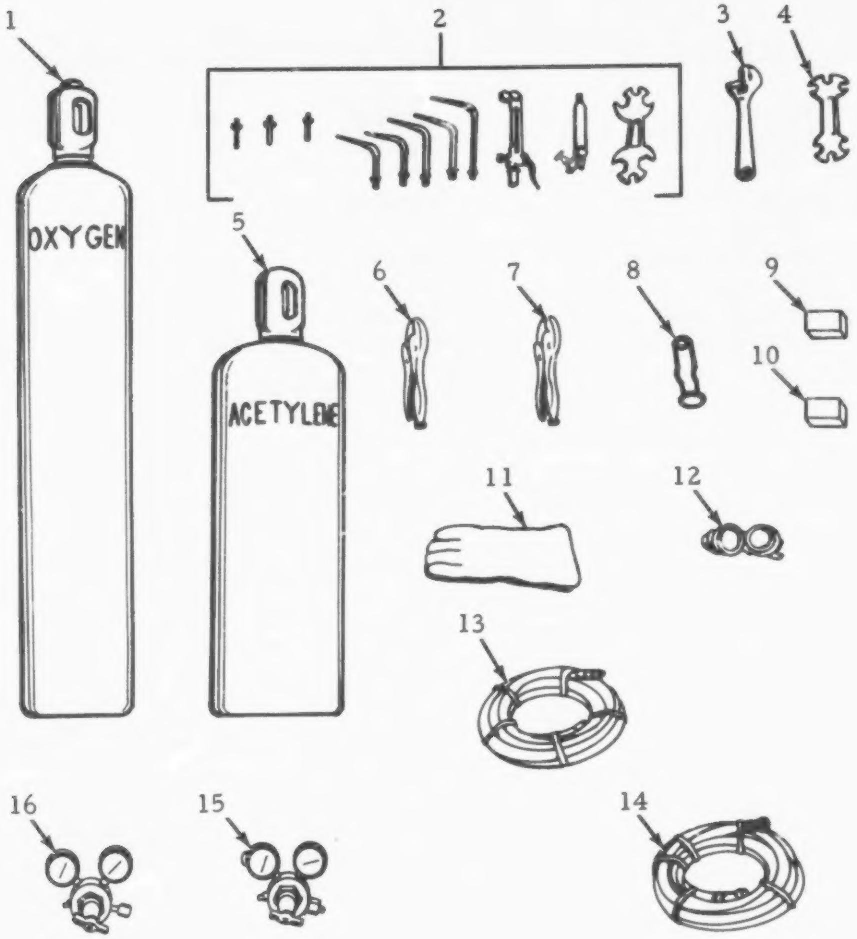
TA171603

EXTERIOR

NO.	TITLE	STRAP ASSY	LENGTH	WIDTH
13	Strap, stowage tray	8690486	80	1
14	Strap, pioneer kit bracket	8690466	20	1
15	Strap, pioneer kit bracket	8690462	12	1
16	Strap, 5-lb sledge hammer	8690462	12	1
17	Strap, crowbar	8690462	12	1
18	Strap, gage	8690471	30	1

Figure B-3. Stowage strap location diagram (Sheet 2 of 2).

TA171604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OXYGEN
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ACETYLENE
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TA038938

Figure B-4. Welding Equipment.

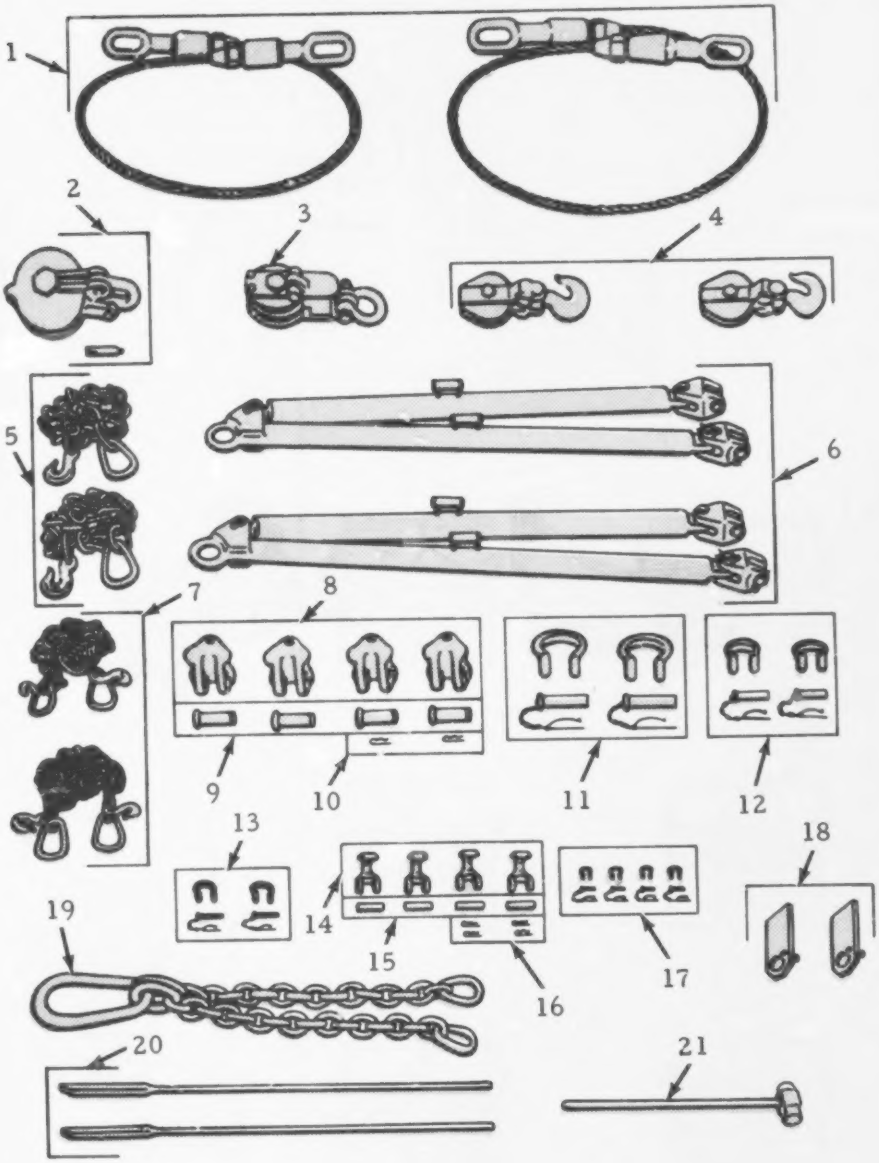
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Figure B-5. Towing equipment.

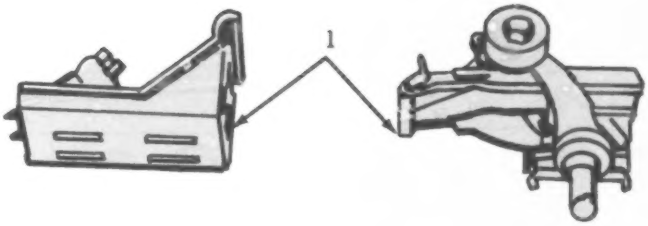

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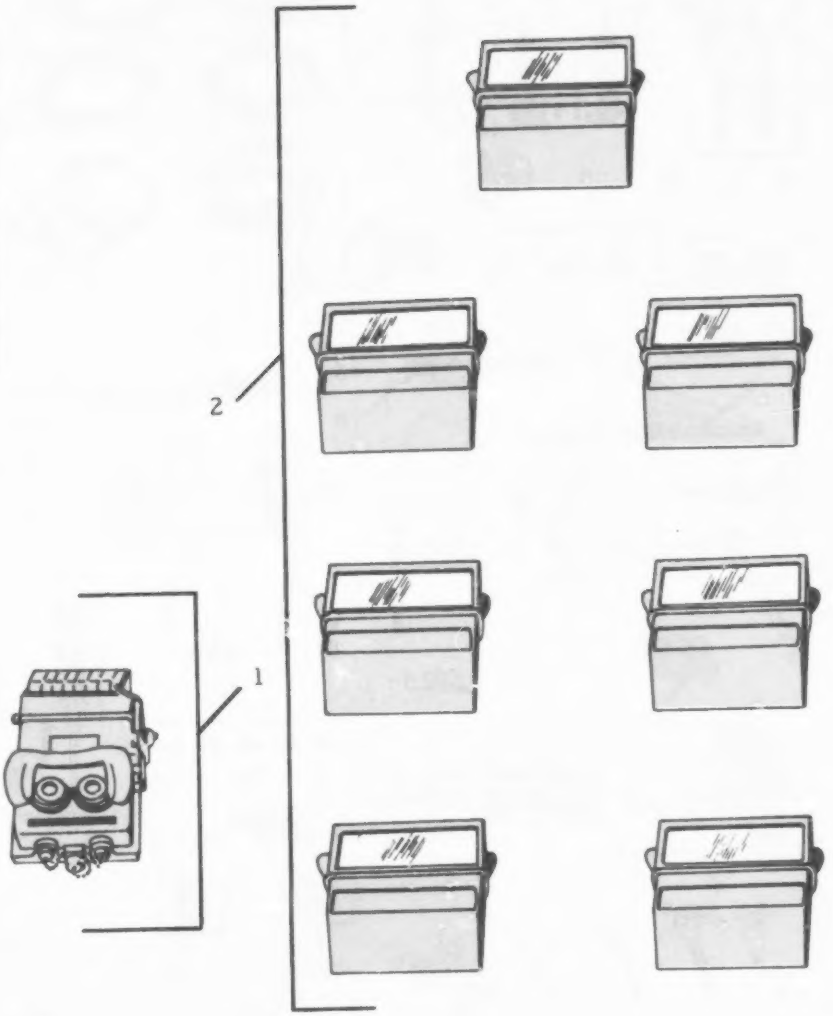
Figure B-6. Caliber .50 machinegun and equipment



TA125586

Figure B-7. Vision devices.

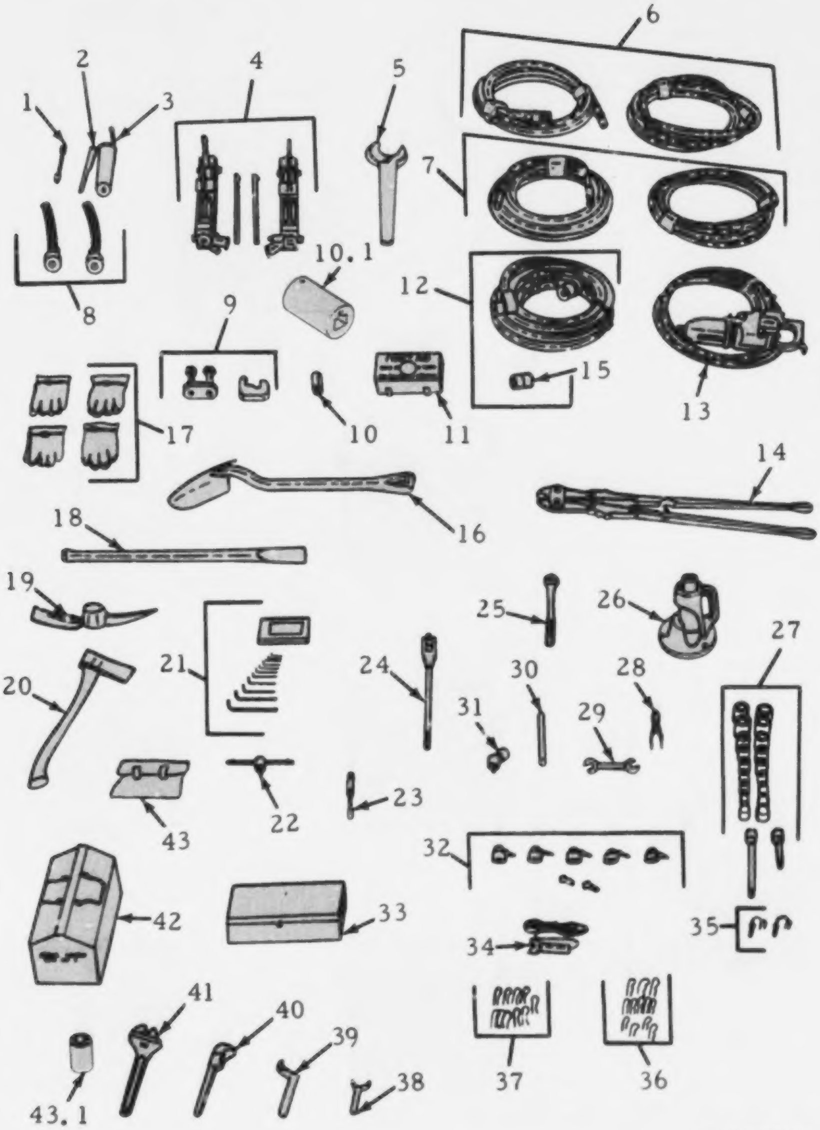

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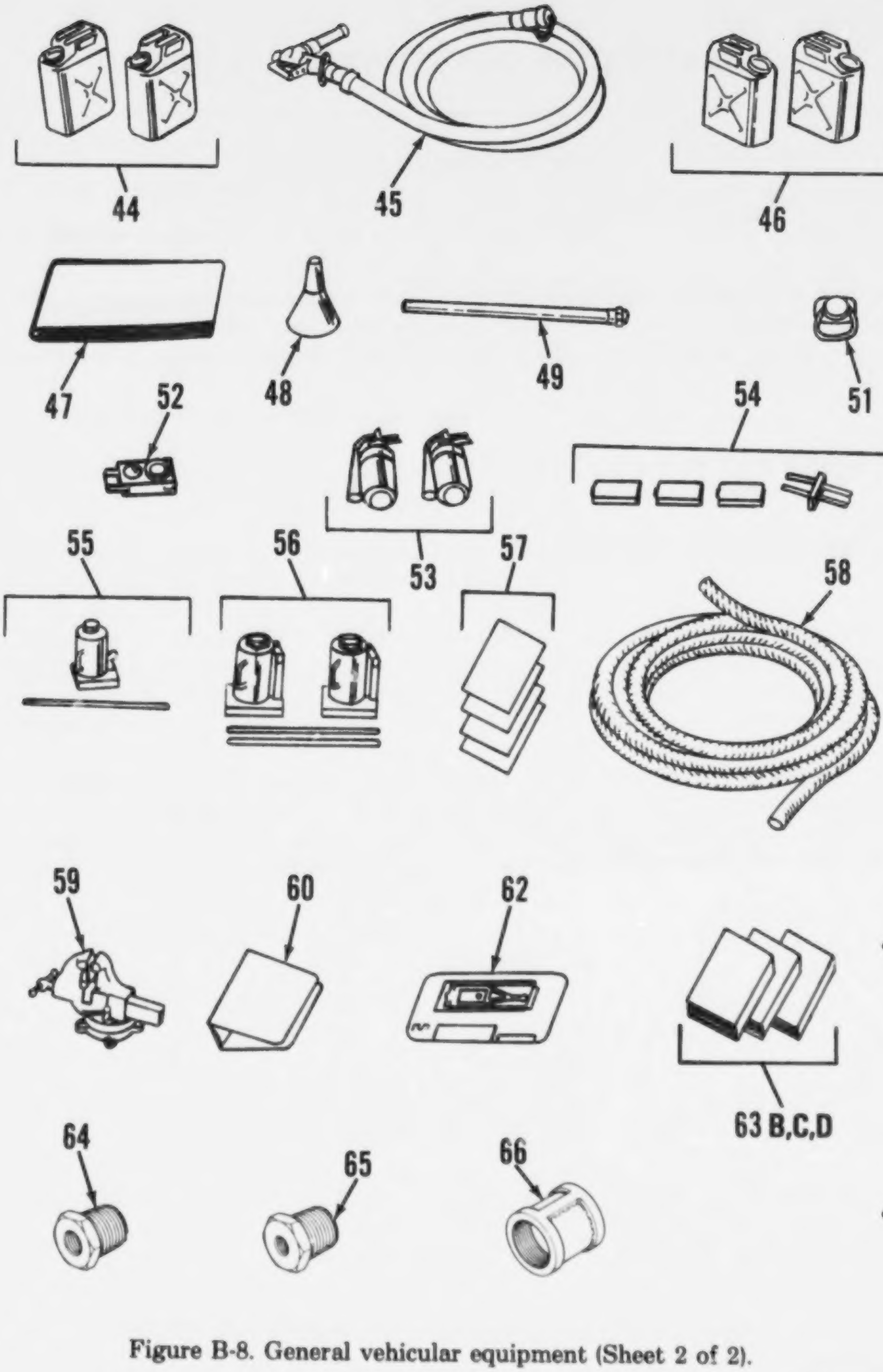
Figure B-8. General vehicular equipment (Sheet 1 of 2).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63 B,C,D
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Figure B-8. General vehicular equipment (Sheet 2 of 2).

TA171605

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APPENDIX C.

EXPENDABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

C-1. Scope.

This appendix lists expendable supplies and materials you will need to operate and maintain the M88A1. The items are authorized to you by CTA 50-970, Expendable Items (Except, Medical, Class V, Repair Parts, and Heraldic Items).

C-2. Explanation of Columns.

a. Column 1 - Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material.

b. Column 2 - National Stock Number. This is the National stock number assigned to the item; use it to request or requisition the item.

c. Column 3 - Description. Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the part number followed by the Federal Supply Code for Manufacturer (FSCM) in parentheses, if applicable.

d. Column 4 - Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (eg., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

TA171606

Expendable Supplies and Materials List

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
1	C	8040-00-290-4301	ADHESIVE, RUBBER BASE, GENERAL PURPOSE: Type II, MIL-A-5092	GL
2	C	8040-00-152-0063	ADHESIVE, RUBBER BASE, GENERAL PURPOSE: Type II, MMM-A-1617	QT
3	C	8040-00-273-8716	ADHESIVE, BONDING: Vulcanized synthetic rubber to steel, class I, MMM-A-121	QT
4	C	8040-00-833-9563	ADHESIVE SEALANT, SILICONE: White, RTV general purpose, Type I, MIL-A-46106A	TB
5	C		ADHESIVE, BONDING: MIL-A-1154	GL
6	C	8030-00-231-2345	CORROSION PREVENTIVE COMPOUND: GR1, MIL-C-16173	GL
7	C	8030-00-062-5866	CORROSION PREVENTIVE COMPOUND: GR4, MIL-C-16173	GL
8	C	6850-00-281-1985	DRY-CLEANING SOLVENT: P-D-680	PT
9	C	8010-00-111-7930	ENAMEL, ALKYD, CAMOFLAGE: Forest green, MIL-E-52798A	QT
10	C		ENAMEL, ALKYD, SEMIGLOSS: Red, TT-E-529D	PT
11	C		ENAMEL, ALKYD, SEMIGLOSS: White, TT-E-529D	PT
12	C		ENAMEL, SYNTHETIC, GLOSS: White, class A, TT-E-489G	GL
13	C	9150-00-190-0904	GREASE, AUTOMOTIVE AND ARTILLERY: MIL-G-10924C	LB
14	C	5970-00-644-2636	INSULATION, TAPE, ELECTRICAL: Black, pressure sensitive adhesive, plastic, 0.0085 thk by 0.75 wide, HH-I-595C	RL
15	C		LACQUER, CLEAR: Spray, TT-L-581	CN
16	C	9150-00-231-6689	LUBRICATING OIL: General purpose, preservative (water displacing, low temperature), VV-L-800A	GL

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Expendable Supplies and Materials List

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
17	C	9150-01-035-5390	LUBRICATING OIL: Gear, multi-purpose, grade 90, MIL-L-2105C	GL
18	C		LUBRICATING OIL: Internal combustion engine, preservative and breakin, Type I, grade 10, MIL-L-21260C	GL
19	C		LUBRICATING OIL: Internal combustion engine, preservative and breakin, Type I, grade 30, MIL-L-21260C	GL
20	C		LUBRICATING OIL: Contact and volatile corrosion inhibited, MIL-R-46002A	GL
21	C		LUBRICATION OIL: Spec MIL-L-2104, Gr 30 for above 30°F	GL
22	C		LUBRICATION OIL: Spec MIL-L-2104, Gr 10 for 0°F to 30°F	GL
23	C		LUBRICATION OIL: Spec MIL-L-10295 for -25°F to 0°F	GL
24	C		PAINT, CAMOUFLAGE: Desert sand, MIL-E-52798, FED-STD-575A, color number 23448L	GL
25	C		PAINT, STENCIL: Lusterless white, MIL-E-52798, FED-STD-595, color number 37875	PT
26	C		PAINT, STENCIL: Lusterless black, MIL-E-52798, FED-STD-595, color number 37038	PT
27	C		PAPER, LENS TISSUE: Type I, 4- by 6-inch sheets, UU-P-313	EA
28	C		PRIMER, SURFACER, SANDING, LACQUER AND ENAMEL TYPE: Surf white, TT-P-659C	GL
29	C		SEALER: Spec MIL-S-12158	PT
30	C		SILICONE COMPOUND: MIL-S-8660B	LB
31	C		SOLDER, TIN ALLOY, LEAD ALLOY: SN 60/40, form B, Type S, QQ-S-571E	LB

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Expendable Supplies and Materials List

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
32	C		TAPE, TEFLON, THREAD SEALANT: 1/2-inch wide, Dwg 10379740	RL
33	C		THINNER: Synthetic resin enamels, TT-T-306C	GL
34	C	8010-00-242-259	THINNER: Paint, mineral spirits, odorless, volatile, TT-T-291	GL
35	C	8010-00-165-4432	VARNISH: Spec TT-V-121	PT
36	C	5610-00-141-7838	WALKWAY, COMPOUND, NONSLIP: Forest green, MIL-W-5044C	GL

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By Order of the Secretary of the Army:

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512		191		Figure 191, item 3 has the wrong NSN. Supply rejects orders for this item. The NSN shown here is not listed in the AMDF or the MCRL. Please give us the correct NSN and P/N.

SAMPLE

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER	SIGN HERE
John Smith S. SGT (317) 793-4714	John Smith

TEAR ALONG PERFORATED LINE

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UNIT'S ADDRESS

FOLD

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OFFICIAL BUSINESS

SAMPLE

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U.S. Army Tank-Automotive Command
ATTN: DRSTA-MB
Warren, MI 48090

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THE METRIC SYSTEM AND EQUIVALENTS

LINEAR MEASURE

1 Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
1 Kilometer = 1000 Meters = 0.621 Miles

WEIGHTS

1 Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces
1 Kilogram = 1000 Grams = 2.2 Lb.
1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

SQUARE MEASURE

1 Sq. Centimeter = 100 Sq. Millimeters = 0.155 Sq. Inches
1 Sq. Meter = 10,000 Sq. Centimeters = 10.76 Sq. Feet
1 Sq. Kilometer = 1,000,000 Sq. Meters = 0.386 Sq. Miles

CUBIC MEASURE

1 Cu. Centimeter = 1000 Cu. Millimeters = 0.06 Cu. Inches
1 Cu. Meter = 1,000,000 Cu. Centimeters = 35.31 Cu. Feet

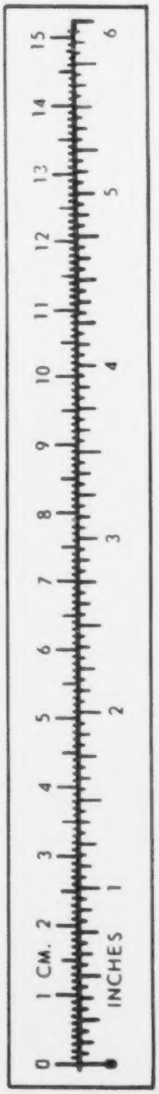
TEMPERATURE

$\frac{5}{9}(°F - 32) = °C$
212° Fahrenheit is equivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
$\frac{9}{5}(°C + 32) = °F$

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
Pints	Liters	0.473
Quarts	Liters	0.946
Gallons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
Liters	Gallons	0.264
Grams	Ounces	0.035
Kilograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pound-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
Kilometers per Liter	Miles per Gallon	2.354
Kilometers per Hour	Miles per Hour	0.621



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